# NATURE MAGAZINE



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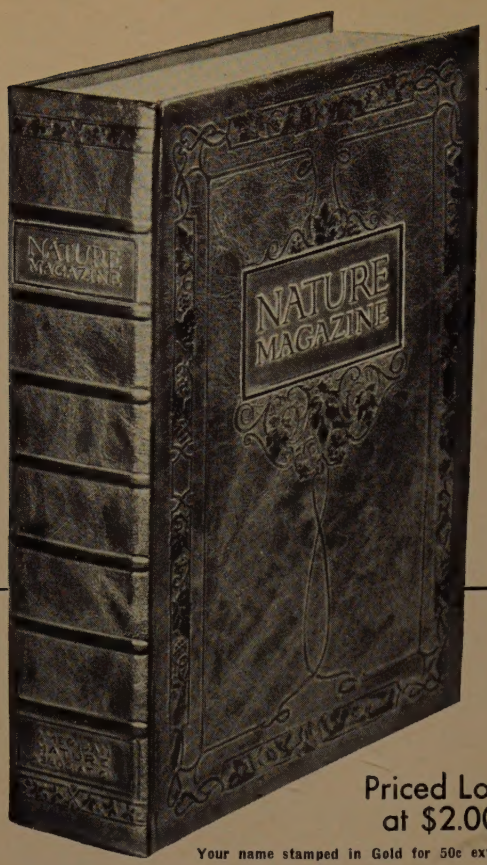


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# RETIRE AT 55 ON $200 A MONTH"

"I'LL DRAW an income of $200 a month *for the rest of my life,* as soon as I'm 55," said a certain man who was discussing his plans for the future.

"How can you do it on *your* salary?" asked his friend.

"Easy," said the first man. "I'm buying a Retirement Income on the installment plan. My income of $200 a month begins when I'm 55, and it's guaranteed for life. No depression can stop it.

"What's more, if I should drop out of the picture *before* my retirement age, my wife would get a regular monthly income for the rest of her life."

"That sounds good," said the other, "but what if you're totally disabled, and can't make your payments?"

"I don't have to worry about that either. If, before I reach 55, serious illness or accident stops my earning power for six months, then—so long thereafter as I remain disabled—my installments will be paid for me, and I'll get a Disability Income besides."

"Fine," said the other. "Can you tell me how much this new Retirement Income Plan would cost *me?*"

### What Does it Cost?

"How much you need to save each month depends on how old you are, when you want to retire, and the size of the income you will want.

"Why don't you write for the book called 'The Phoenix Mutual Retirement Income Plan'? They'll send you a copy free. It tells all about how the plan works."

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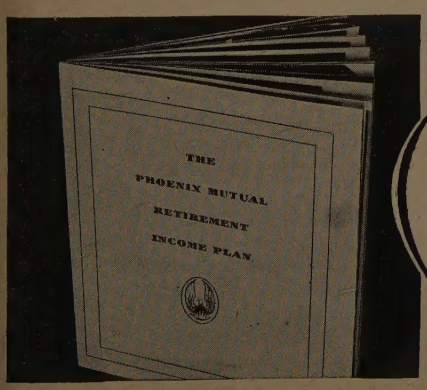


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## CAMERA AND MICROSCOPE

### By Herbert C. McKay, F. R. P. S.

**While professional photomicrography is a complex and exacting technical procedure, any amateur photographer who has a microscope can easily make presentable photomicrographs.**

That which can be seen can be photographed. It is not always easy, but it can be done. It may be regarded as a curious fact, but fact it is, that success depends more on the patience and knowledge of the photographer than on his elaborate and expensive equipment. In photomicrography, for example, the beginner's results are often so disappointing when he tries to use the cumbersome and complicated laboratory equipment, that he becomes discouraged and gives up. The probability is that had he started with a simple outfit he would have had little or no difficulty.

It is not intended that the impression

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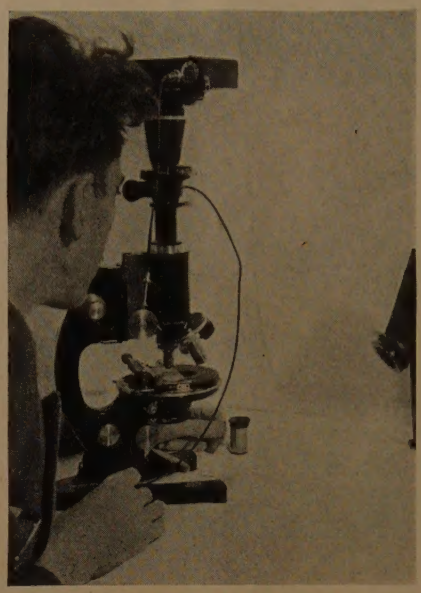
be given that photomicrography is child's play and that its reputed difficulties are non existent. Professional photomicrography is a complex and exacting technical procedure. Many of the problems which confront the photomicrographer are almost insuperable. Because of the nature of the subjects with which he is called upon to work, and because of the conditions of lighting and the magnifications with which he is forced to work, he must know his craft thoroughly and must be equipped with the finest apparatus which the ingenuity of man has been able to devise.

Any amateur photographer, however, who has a microscope of even fair quality can make photomicrographs which will be satisfactory. Before proceeding with this discussion, let us understand just what is meant by satisfactory results. If we assume that the average snapshot is satisfactory, then we have a standard. The amateur's photomicrographs may not show some of the finer detail, it may be just slightly off the sharpest focus, but it will show the general configuration of the subject as well as the average inexperienced person could see it through the microscope itself.



THE CAMERA HAS BEEN PLACED ON THE MICROSCOPE INSTEAD OF THE USUAL EYEPIECE. THE OPERATOR FOCUSSES THE INSTRUMENT AND ARRANGES HIS FIELD BY LOOKING INTO THE SIDE TELESCOPE, THUS MAKING IT POSSIBLE TO LEAVE THE CAMERA IN PLACE WHILE MAKING A COMPLETE SERIES OF PHOTOMICROGRAPHS.

While the professional must work with magnifications up to 5000 diameters, has to worry about resolving power of his lenses, the illumination of transparent, colorless specimens and other such problems, the amateur usually works with plant or animal specimens, at powers between 25 and 250 diameters, and usually with colored specimens.

The first thing to do is to make sure that the light source is lined up exactly with the microscope, so that the microscope mirror is set with its pivots parallel to the transverse plane of the instrument.

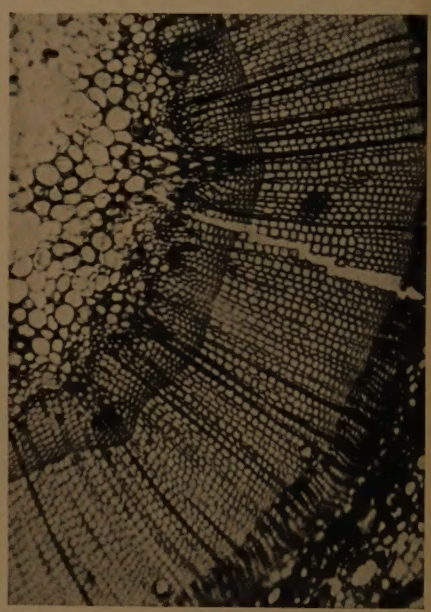
When this is done place the slide on the stage and focus it with the objective to be used. Now move the slide until an empty field is presented. Remove the eyepiece from the microscope and looking down into the tube at the top lens of the objective, slowly close the substage iris diaphragm until it is seen barely encroaching on the edges of the field. Do not use a larger iris opening than this.

Replace the eyepiece. When the specimen is again examined it should appear sharper and brighter than it did. Mark the setting of the iris control lever. Open it and observe the haze which appears to cover the object, close the iris beyond the point marked and notice the broadening of the outlines and the obscuring of finer detail. Reset the diaphragm to the point marked.

Look at some distant object to rest the eyes and to bring them to infinity focus. Refocus the microscope, making no effort to accommodate the eye. Do it all with the focussing adjustment of the microscope. Look again at a distant object and then see if the microscope appears to be focussed sharply as soon as you look into it. You should learn to use the microscope at all times with the eye relaxed. When this is done the microscope itself is set for "infinity focus".

If your camera has a focussing adjustment, set it at the maximum distance or infinity. This will be the focussing mark which brings the lens closest to the film. If the camera is fixed focus it will work all right. Now support the camera above the eyepiece of the microscope so that the camera lens almost touches the microscope eyepiece. If the camera lens is larger than the top of the eyepiece, cut a piece of cardboard in the form of a two-inch circle. Cut a hole which will fit snugly around the microscope tube and cover the card with black velvet. This will keep stray light out of the lens.

Set the camera shutter for a bulb exposure. As the exposure itself depends so much on the strength of the light, the magnification and the specimen used, the correct exposure must be determined by experiment. If you use a plate or filmpack camera you can expose successive strips on the same film by withdrawing the slide a half inch



CROSS SECTION OF A PINE TWIG MADE WITH A SMALL PHOTOMICRO OUTFIT.

for each exposure, but with a rollfilm camera you will have to use a whole film.

If you are using a high-powered light, such as a micro arc light, the exposure may be as short as one second. If you are using a forty to sixty watt incandescent lamp the exposure may be as long as ten or twenty seconds. Do not use daylight as it is too variable. To make the test support the camera above the microscope and give exposures of 1-2-5-10-25 and 60 seconds. When the test film is developed, one exposure will be close enough that you can estimate the proper exposures for succeeding trials. A little experimentation will soon give you a mastery of the exposure problem.

The miniature cameras which use motion picture film are excellent for this as for all natural history work. They are provided with stands for making photographs from

(*This is continued on page* 147)

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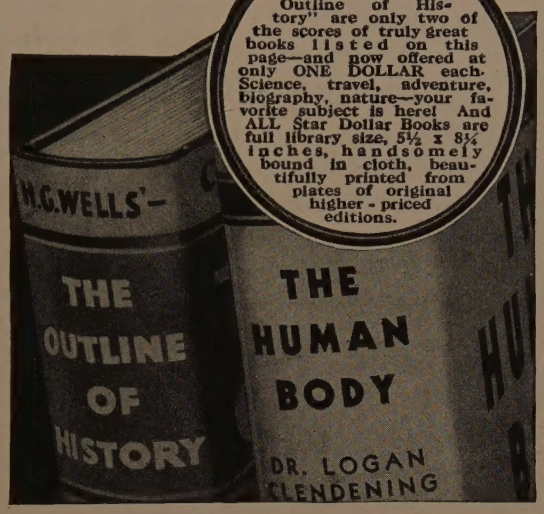


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# THE UNITED STATES BIOLOGICAL SURVEY

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## REDUCED APPROPRIATIONS THREATEN BIRD PROTECTIVE WORK

• • •

NEARLY half a century ago a few earnest students of birds, realizing the importance of these creatures to agriculture, the industry on which all of man's pursuits must ever be basically dependent, sought the cooperation of the Federal Government in setting up an organization to coordinate all investigations of this subject. For nearly a hundred years individual naturalists had studied the habits of our birds, and a few States had recognized the practical importance of such studies to the extent of establishing small units to deal with the subject, but there had been no national organization. As a result a small office was set up as a branch of the Division of Entomology of the United States Department of Agriculture. Dr. C. Hart Merriam, one of the foremost of America's younger naturalists, pupil of Agassiz and Baird, was selected as its first head.

Merriam sought first to learn the geographic distribution of all our birds, and under his able leadership several of the best field naturalists of the country were soon at work. Naturally, the personnel was small, and the appropriations meager, but the earnestness of the workers lessened this handicap. Within a few years the information that had been gained under Government auspices in prosecuting the geographical and zoological explorations and by private enterprise, had been supplemented by detailed studies in many parts of the West and by several expeditions to Alaska, northern Canada, and Mexico. Results gained in summer work were elaborated during the winter. The results obtained by Merriam with his small force became the marvel of the leaders of other institutions. Gradually the organization grew, its functions were enlarged to take in game protection and the suppression of noxious species, and finally, by virtue of a treaty with Great Britain and the consequent cooperation with Canada, the care of the migratory birds of the continent.

By this time the Bureau of Biological Survey was recognized, both in America and abroad, as the clearing house for information concerning the distribution, habits and classification of North American birds and mammals. Its files of information far exceeded in volume and variety those ever before gathered from a definite geographical unit. Literally millions of facts were carded and so arranged as to be quickly available, and the resulting knowledge was freely drawn on by individuals and organizations the world over. Naturally this information was invaluable in the formulation of legislation designed to perpetuate the fauna of North America. A striking example is the battle that for two decades has been waged to safeguard a class of birds, the waterfowl, that is still in grave danger from overshooting.

Just now the Biological Survey, which has proven to be so important in perpetuating our resources in wild life, and upon which scores of our most beautiful and useful species of birds must depend for their continued existence, faces a sad future. One of its most important divisions, Food Habits Research, that which has to do with the economic value of our birds and mammals, is due to be eliminated, for in the budget estimates for the coming year no appropriation is provided. Furthermore, there are no funds for continuing investigations on waterfowl, and the funds for the acquisition of bird refuges and for the protection of our migratory birds—waterfowl, shorebirds and the hundreds of species of small migrants—are greatly reduced. This means a lesser number of Federal protectors, already a force pitiful in numbers, considering the tremendous extent of the country to be covered, and the indifference of the average gunner to the fate of the creatures he pursues.

As is always likely to be the case where an organization seeks to safeguard a resource of national importance, the Biological Survey has not been free from political pressure from those who seek to exploit these resources. Such pressure, at different times, has taken the form of more or less thinly veiled threats, or of promises of benefits, according as to what attitude it might assume regarding killing privileges. The Survey is, therefore, particularly in need of friends at this critical juncture.

Those interested in the perpetuation of our sadly harassed migratory game species cannot but wonder what may be the reasons for this move, which will lessen so greatly the chances of survival of so many species. Surely the saving of the comparatively few thousands of dollars in the face of vast expenditures for a variety of far less fundamentally valuable projects does not justify such a sacrifice of irreplaceable bird life. It is the belief of the American Nature Association that all lovers of wild life should demand restitution of all items necessary to insure the continuance of the vital scientific and protective functions of the Biological Survey, for it is the only Federal agency now fighting to preserve from extinction many of our finest birds. Their fate at this moment lies in the hands of the Congress.

"DURING AUGUST . . . HE MADE FRIENDS,
OF A SORT, WITH A LARGE GRAY SQUIRREL"

NATURE MAGAZINE

VOLUME 23 MARCH · 1934 NUMBER 3

# "GRUNTS"

## THE AMAZING STORY OF AN ALTOGETHER AMAZING SQUIRREL

BY JULIE CLOSSON KENLY

ILLUSTRATED BY R. BRUCE HORSFALL

THE STORY of "Grunts" is that of a small, feathery-tailed squirrel: but its significance lies much deeper than a mere enumeration of the doings of this quaint little animal. It passes, in fact, into ponderous regions of psychology and philosophy, and shows that circumstance snaps its fingers at a million years of instinct, and produces a prodigy by a trifling shift in adjustment.

Like most of his master's and mistress's pets, "Grunts" was a child of misfortune; thrown into their arms, so to speak, by a smashing rain. A mere baby, his hair matted down by the water until he looked like a poor little mummy strapped in gray cerements. A wreck out of the elements, who required a night of vigil, supplemented by hot blankets, and hot malted milk, which he took from a medicine dropper grasped between his tiny thumbless hands, and drank with loud thankful suckings.

. . . HOT MALTED MILK, WHICH HE TOOK FROM A MEDICINE-DROPPER GRASPED BETWEEN HIS TINY THUMBLESS HANDS

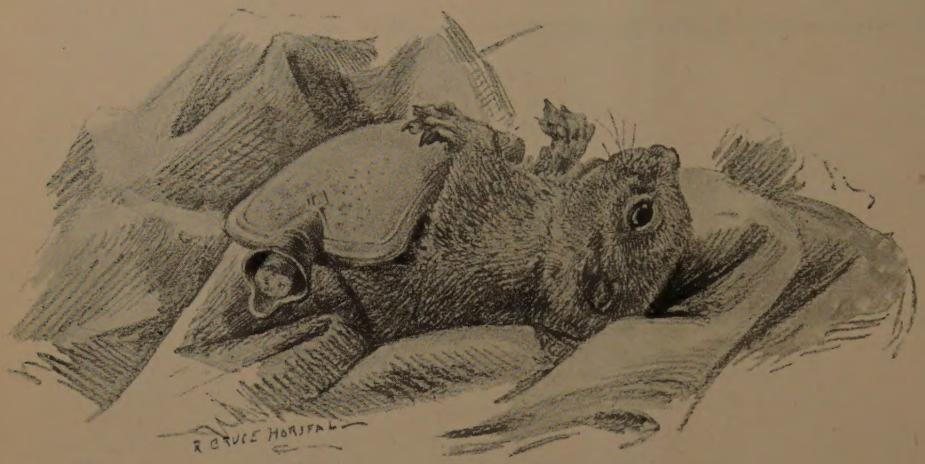
"Grunts'" homely name was misleading, suggesting as it does the pig-sty, for nothing could be further, spiritually, from a pig than "Grunts." He was so christened because never, during all his varied experiences, did he more than once or twice emit any truly squirrel sound, but always spoke in a soft little grunt, reminiscent of the rumbling purr of a cat. He was never heard to chatter, never to scold, and only in a few instances of physical agony did he raise his voice in the shrill shriek of protest by which ordinary squirrels inveigh against untoward fate. His was a totally un-squirrel-like approach to life, for "Grunts" was at heart both a gentleman and a sentimentalist.

As a small child "Grunts" was never spry and playful as young things ought to be, and many were the anxious hours he caused his foster parents, who regarded him as an unescapable obligation which Nature had put upon them, a beloved invalid who had a place in the world to fill and must be nursed back to health so that he could do his bit. This required several visits to an animal hospital and a rather surprised veterinarian, who admitted that his practice among wild squirrels had been limited. It was at this animal hospital that "Grunts" first showed his amazing common sense. Due to a fit, his hind legs had become temporarily paralyzed, and he seemed as anxious as any one to have his case properly diagnosed. He lay quietly on his back on the operating table, allowing himself to be examined with a stethoscope and have his temperature taken. Indeed, one feels sure that had he been requested to stick out his tongue he would have done so immediately. All through the tedious examination and the subsequent irrigation, he never showed a particle of fear or resentment, though he was, one feels quite sure, the only wild squirrel that had been given this up-to-date treatment! There was always something of the neurasthenic about "Grunts." He dearly loved any

sort of fuss being made over him by solicitous friends.

On his return from the hospital, he was accompanied by medicine bottles as tall as he was. When the front door was opened he dragged himself painfully into the kitchen and—went to bed! He knew he was ill. He knew he was interesting. And that night he slept with a doll's hot-water bottle on his stomach.

The following story fully illustrates the curiously



HE KNEW HE WAS ILL. HE KNEW HE WAS INTERESTING. AND THAT NIGHT HE SLEPT WITH A DOLL'S HOT-WATER BOTTLE ON HIS STOMACH

neurotic streak in "Grunts' " character. One day his mistress stepped on his paw. An unavoidable accident because he was a slippery gray shadow forever under one's feet. This was one of the times "Grunts" squealed as a squirrel must when even a scant hundred pounds comes down on its little bones. He was heartbroken! No one had ever hurt him before. He did not know what to make of it, and at once insisted on being petted and consoled; lying on the living room sofa—a perch of honor he was not generally allowed—and demanding atonement for his injury by strokings and condolement. But as dinner time approached, his mistress had to leave him for more pressing duties, and while she was among her pots and pans she thought she heard a noise in the living room that sounded like the scrabble of little feet. Tiptoeing quietly to the door she peeped in. There was "Grunts" careening up and down the window screen, miraculously whole again! Being a person of great tact and delicacy of feeling, this understanding foster mother stole softly away, to return a moment later, but making loud clatterings as she approached. A limping "Grunts" hobbled over from the window to meet her; and a limping "Grunts" followed her all the rest of the afternoon! This is one of the "Grunts" stories that it takes courage to tell—but it throws an important light on "Grunts' " character.

No attempt was ever made to tame, train or coerce "Grunts"; he was simply what he wished himself to be. The result was interesting; sometimes trying, as theories of perfect self-expression do not necessarily meet with the unqualified approval of a grandmother. "Grunts" was always lovable, but less so in the butter dish, cream pitcher, marmalade jar and bread plate than at other times—and he had a way for such misadventures.

It was in accordance with these theories of complete liberty of action that "Grunts" was allowed the run of the house and grounds, with no restrictions whatsoever. Yet he not only never evinced any tendency to run away, but he never even wanted to play out-doors unless some of the family sat there with him. He was like a lonely child in this respect. Indeed, he seemed not to take any interest in creatures like himself. This odd being, scarcely three months removed from the panic that ordinary squirrels show in the presence of man, felt only kinship for human beings. At best "Grunts" was never, as far as other squirrels were concerned, truly sociable. During the earlier part of his life he was thoroughly intimidated by his own kind. His whole bearing was different from the rest of his race. He moved more leisurely, without flashing the quick looks about him that mark even moments of relaxation in typically wild creatures. He had been brought up among quiet, considerate people, and his manners reflected his environment. Having no fear of strangers, his greeting was to run up one side of their skirts or trousers, and, crossing over their shoulders behind their heads, run down the other side; which complete survey was in the manner of an introduction.

His master and mistress kept a sort of bird bread-line behind their house, where there were unlimited crusts and corn for all the wild creatures of the neighborhood, and as a result there was never an hour of the day that squirrels were not feeding within a few feet of the back door. Never but once or twice did "Grunts" deliberately attempt to mingle with them, because "Grunts" was sensitive. The other squirrels did not like him and he knew it. They seemed actually to sense something alien about him: possibly a human-being odor, possibly a total absence of fleas, possibly a vague suspicion that he was a "sissy." They did not fight him, only edged coldly away when he appeared. The first snub to his poor little feelings occurred in this manner. He was playing at the back of the house, but where he was safely in sight of members of the family, when he actually was emboldened to go up to some gray squirrels who were eating crusts, and make rather a tentative offer to speak to them. But the gray squirrels were snubby. They eyed him suspiciously and turned away. He followed. Again they gave him no encouragement, but moved further on. This was repeated until they had edged distrustfully to the very end of the feeding ground. What went on in "Grunts' " mind no one knows; but this is what he did. Looking at them for a moment with a wistful droop of his tail, he suddenly

began to turn somersaults. Over and over he catapulted. The squirrels watched him, unmoved. Then he ran to a huckleberry bush and, catching to it by his hind feet, began swinging back and forth, back and forth, an intriguing and totally unexpected bit of trapeze work. But even then the two gray squirrels remained obdurate, and turning their backs on him slipped into the bushes. It was evident that "Grunts" was hurt. He never again tried to show off. It was useless: Prowess got a body nowhere!

A LIMPING "GRUNTS" HOBBLED OVER FROM THE WINDOW TO MEET HER; AND A LIMPING "GRUNTS" FOLLOWED HER ALL THE REST OF THE AFTERNOON!

But while "Grunts" might be lacking in a sense of racial unity even to the point of showing, later in his life, a rather lofty contempt for his kind, there is no exaggeration in saying that he passionately loved his master and mistress, and this love was the mainspring of his very life. If he came into the house and did not find them, especially if he were driven in by the undesirable proximity of some other squirrel, he would dash upstairs to their bedroom hunting for them. Later in his life he found a fetish to worship in his master's clothing, which, when changed, might be hurriedly tossed on a chair. Snuggled among these garments "Grunts" could always be found, if his master were not in the house. When he first began to do this he was apparently lost for hours, to be discovered later squeezed tightly into the pocket of the trousers. Indeed, there was never a more affectionate pet. He would lie in his master's or mistress's lap, or preferably curled up on their breasts, while they stroked him; the expression on his face truly ludicrous! It could be likened to nothing so much as the mystical peace on the features of an image of Buddha. His favorite position was to snuggle into the breast pocket of his master's khaki shirt, head down and invisible, only his plumy tail dangling out. When his master and mistress left the house for any reason without taking him, he would watch them from the window as far as he could see them, sitting on the sill, his paws over his chest, his whole body tense. When he heard them come in again, he would be wild with joy, often resorting—if their absence had been unusually long—to his means of expressing rapture, namely a series of absurd somersaults, whirling over and over, an ecstatic little gray pin-wheel.

A SERIES OF ABSURD SOMERSAULTS, WHIRLING OVER AND OVER, AN ECSTATIC LITTLE GRAY PIN-WHEEL

"Grunts" was what the darkies call very "choosy" about his bedroom. First he ordained to sleep on a pile of sweaters arranged for him in a basket in the kitchen. Then he tested out several localities, including the drawer where the silver was kept. This, of course, necessitated a removal of the silver and the installing of "Grunts" in its place, as "Grunts" was never thwarted. His manner of sleeping was most curious. Possibly in imitation of the human example with which he was familiar, he slept for the most part directly on his back, his paws in the air, his legs stretched out as a child's would be. He loved, early in the morning, to get in the bed with the family; a position that permitted the bed clothes to be pulled up under his chin. His tiny head, in the center of a large white pillow, with the sheet neatly drawn across his chest and his paws resting outside, was an irresistibly funny sight!

It was concerning this question of sleeping quarters that one of those extraordinary things happened for which no explanation can be offered unless it was that "Grunts" possessed that understanding of words, or the thought that prompts them, which we find in dogs; or else that he was a favorite pawn of Coincidence. It was drawing near the time for the family's summer departure to his foster grandmother's house. She had been warned that "Grunts," being an accredited member of the household, was not to be put into any lowly cellar or garage. He must have a room to himself and be treated as an honored guest. One evening a member of "Grunts'" family, coming into the kitchen and seeing him in his bed, observed: " 'Grunts,' if you are to have a room to yourself this summer I shouldn't think you'd be content to sleep out in the kitchen here!" A short time later he hippity-hopped up the stairs to his master's bedroom, *and never could be induced to sleep in the kitchen again!* This was a form of coincidence that was repeated so many

IF ONE MERELY MENTIONED CASTOR- OR CODLIVER-OIL TO HIM HE WOULD CLOSE HIS EYES IN HORROR, GRIP HIS JAWS SHUT

times in this odd little creature's life that those who knew him best did not find it hard to believe that—if thoughts do flash and flutter through the ether—the mind of a super-squirrel may catch them even more readily than the highly insulated personality of man: and no one can deny that "Grunts" was a super-squirrel.

Another instance of this apparent telepathy on the part of "Grunts" fell upon a rainy day, when he was curled up on his mistress's lap, being stroked into his state of rapturous peace. The especial member of the family who seemed to be most *en rapport* with him observed: "Aren't you ashamed to lie there, 'Grunts,' so warm and dry when all the other poor little squirrels are out in the cold?" Presently up jumped "Grunts," and going to the screen door, asked to be let out, with the scratchings he used for that purpose. When on the porch, he sat down, cold and miserable looking—yet he refused to come in! Could any one be blamed for thinking the obvious thing, that "Grunts" possessed the spirit of the martyr?

"Grunts'" progress north this summer included an over-night stop, and all during that time he seemed to be aware that the end of his journey had not been attained, and that his beloved master and mistress were going to move on and possibly leave him behind—an instinctive fear common to pets on the move. He was very nervous all that day and wanted to stay close to his family. Next morning the car was packed and ready to start when it was found that "Grunts" had disappeared. Panic ensued! It looked for a while as if all the summer plans would have to be changed. The house and grounds were searched by a truly frantic family. "Grunts" had never been to a city before, and it seemed more than probable that he had darted out into the street beyond the front gate and been run over. And then—glorious moment of relief!—he was found. Where? On the one spot that had been overlooked. The one spot that would have insured his departure: perched safely and firmly on the top of the lunch basket! Did he reason that the lunch basket could not be forgotten though, unhappily, a squirrel might be? No one can tell—just another coincidence to chalk up on the record of this strange little child of Nature, who had never put on his birthright of wildness since he was rescued from the puddle that brought him into our lives and human ideas.

"Grunts" had two obsessions of fear, both the outcome, in all probability, of his early misfortunes. He was horribly afraid of thunderstorms, and insisted on burying his head under his mistress's arm while the noise was going on. The first mutter of thunder would send him scuttling in, if he happened to be out of doors. His second obsession had to do with the giant bottles of his childhood. If one merely mentioned castor- or cod-liver-oil to him, he would close his eyes in horror, grip his jaws shut, and wave his paws before his face as if to fend off something too awful for a squirrel to contemplate!

It was an extraordinary thing that only once in his life did "Grunts" ever bite anyone. This time he nipped a visitor's ear, in passing across his shoulders, and it was only because the friend—not especially relishing the proximity of those needle-sharp teeth and claws, made a hasty gesture of defence. The highest mark of "Grunts'" esteem was to nibble at one's fingers, but always gently. Even with the little children of the family, and during the wildest romps, not once did he inflict the slightest wound. His food could be literally taken out of his mouth without any resentment on his part. When one thinks that it is not safe to do this to a dog, if it is feeding, and that a dog has had thousands of years of civilized manners pounded into him, it makes "Grunts'" self-control the more remarkable.

As "Grunts" grew into manhood, it was expected that he would show some interest in rearing a family of his own, but we soon found that "Grunts" was either a confirmed bachelor or an idealist. During August, when he spent a good deal of his time asleep on the branches of an oak tree beside the house, he made friends, of a sort, with a large gray squirrel. An unprepossessing person, with bald spots of August molt. But when she showed too much interest in him, he raced back to the house in a panic and would not go out for some time after, so much did he dread again meeting the mangy hussy!

On his return to the place of his birth at the close of the summer, he gave every indication of recognizing the house, even, as the car turned in at the driveway, beginning his joyful somersaulting in honor of the occasion. During September and October he took up his old life again, in not a very different fashion from before. He saw a little more of the bread-line squirrels than he had done, and now he decided to sleep in the garage instead of the house; but he still spent most of the daytime napping under the pillows of his mistress's bed. Once he brought a friend—presumably a lady, as she was of more commanding stature than he—to the back door; but she refused to have anything more to do with him when she saw where he lived. (Continued on page 146)

**LIKE RANKS OF SOLDIERS DRAWN UP IN PARADE FORMATION**
The white-stalked clubs of this species of slime-mold are often to be found completely surrounding the small twigs on which they like to grow

# ANIMAL INTO PLANT

## BY CAROL H. WOODWARD

PHOTOGRAPHS COURTESY NEW YORK BOTANICAL GARDEN

FALLEN tree trunks that block a wooded trail and impede the swinging stride of the hiker hold wonders for those who stop to scrutinize them as they straddle over. They are a favorite habitat, for instance, of the so-called slime-molds—small bits of growing things which look, to the unpractised eye, like ordinary fungi.

They are not fungi, however, but, instead, are one of the most mystifying forms of life—an animal which turns into a plant. That is, in one phase of the slime-mold's life, in which it looks like a mass of gelatine, or merely a wet spot on an otherwise dry surface, it has characteristics belonging to the lowest forms of animal life. It even moves as a body, something plants are not known to do.

Then when this formless creature changes into a plant, its various species resemble many of the fungi. Some are like tiny puffballs—flesh-colored, or orange, or brown,

**LIKE A CROP OF TINY PUFFBALLS ON AN OLD BOARD**
When the dark brown casing of these are crushed a cloud of powdery pink spores is thrown out into the air to carry on the cycle of the species

**AS THOUGH TEMPTING THE DRESSMAKER**
Some of the slime-molds appear in strange formations as with this one which looks much like soft, brown, velvet fringe

FAIRY GRAPES MIGHT BE A GOOD NAME FOR THESE CURIOUS GROWTHS

And such a descriptive title would be a good one because this kind of slime-mold always bears a cluster of spore-cases on each of the miniature stalks

or deep violet. Others are like miniature clubs on slender stalks, some of which have an almost microscopic cage surrounding them. Soft, brown, velvet fringe and yellow chenille are the forms assumed by others, while still different species trace a pattern of white lace across dead leaves.

No matter where one walks in the woods, one is apt to find them, because these minute living things have spread themselves widely over the earth. So numerous are they that one enthusiastic amateur, Robert Hagelstein, who has given his entire collection to the New York Botanical Garden for a special display, has found, within ten miles of his home at Mineola, Long Island, nearly one hundred and sixty of the three-hundred species known the world over. Visitors to the Garden may see the collection.

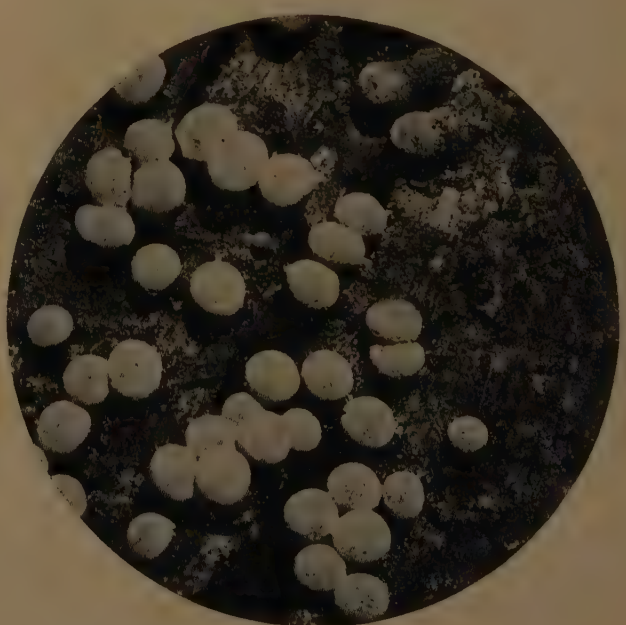
Although the slime-molds—otherwise known as Myxomycetes or Mycetozoa—demand moisture, they are yet able to rest for years when conditions are dry, then resume growth normally when wetness reappears. Although they thrive on summer heat, they are found not only in tropic and temperate zones, but in the snowy regions of the north.

It is said one can smell them in moist woods when they are numerous, particularly when they are in the animal stage. They are seldom seen thus, however, because they usually grow hidden in a rotted log, beneath the bark of a tree, or pressed between two dead leaves.

Some rare day, however, one will notice an almost

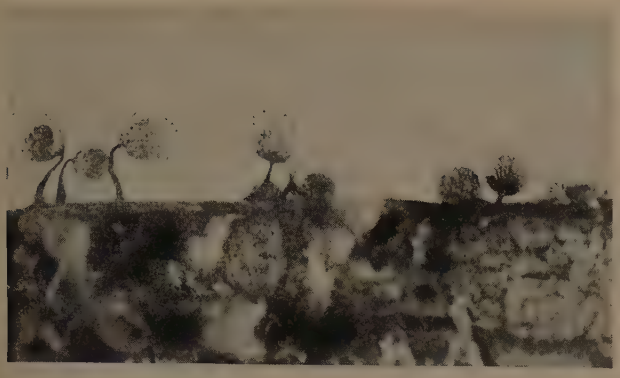
LOOKING THROUGH THE MICROSCOPE

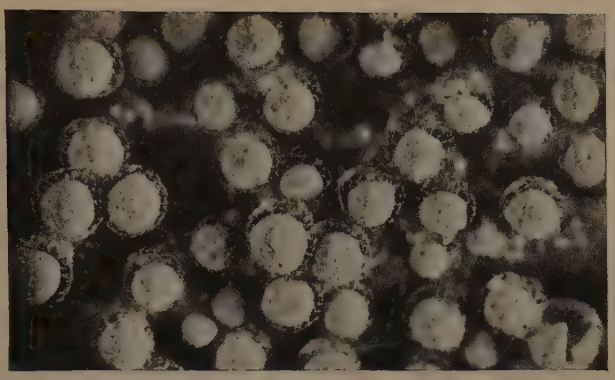
The magnified view shows this interesting picture of the chenille-like slime-molds



INTERESTING STAGE OF SLIME-MOLD

This plant phase, or fruiting form, is the one most commonly seen. Its name is Badhamia utricularis





**ABOUT SOME OF THE SLIME-MOLDS THERE ARE FINE BITS OF BASKETRY**

These allow the ripened spores to sift out through the openings and escape to sail on the wind. These photographs of the detail are magnified about ten times

colorless slimy mass on an old log. With a small microscope one will be able to see it slowly moving; first forward, then back; forward, then back, always further in one direction than in the other, and always leaving a thin trail of refuse behind it. The slime-mold in its animal stage feeds mainly on bacteria which it finds on the decaying wood, or occasionally on higher fungi, ingesting food from the surface and casting off what it can not use as it moves ahead. If it happens to be living in an upright tree trunk, it will move upward as easily as downward or around. It has therefore been called "the only liquid that will run uphill."

It is difficult to gather slime-molds in the animal stage, because this shapeless mass, which is known as the plasmodium, is so sensitive to outside motion that, though it will live for years if merely dry, it will die in an hour if it is transported without the utmost care.

**ROBERT HAGELSTEIN IN HIS HOME STUDY**

The Honorary Curator of Myxomycetes (slime-molds) at the New York Botanical Garden

Seldom does one see a slime-mold in the act of changing from the animal phase of its life to its plant-like existence. For in a few brief hours the plasmodium may emerge from the bark of a tree or a crack in a log, move about until it finds a suitably dry spot, and then, as speedily as the mushroom which springs up over night, it will take on a more and more definite form and color, and with them the attributes of a low order of plant life.

Within certain walls of this new-born plant, spores are formed, somewhat as they are formed in mushrooms and other fungi. When they are ripe—puff! They are scattered by millions. Some of them burst through cracks in the walls which have been retaining them; some issue through minute pores like smoke from a chimney; those which have structures like bird-cages surrounding them are sifted out like pepper from a shaker; still others are released by a spring-like action in spiral threads which entwine them tightly.

Those that light in favorably moist spots will start to grow quite soon. If a sister or a brother spore is germinating nearby, two of them will join hands, so to speak, and together they will grow into a new plasmodium. The mass of gelatine moves about again in animal fashion, and again will give rise to structures which will, in turn, bear spores like plants.

●

Many are the poets who have sung songs of Spring in inspired verse. We all look forward to Spring as happily inevitable. But we asked ourselves the other day: "What about Spring? Is there a story in it?" So we called in Charles Fitzhugh Talman, noted weather authority and writer, and asked him about it. "Certainly there is a good story about Spring. You'd be surprised." We told him to go ahead and surprise us and he did. So the April issue will be featured by a story of this vernal season, what it means in weather terms and what it has meant down through the ages. You will find it as interesting as we did

A TREE-HOPPER OF A STRANGE, BIZARRE DESIGN

Magnifying the insect twenty-five diameters in the photograph we are able to see its strange structure. Such oddity of formation is characteristic of these insects

# TREE-HOPPERS, INSECTS WORTH KNOWING

BY W. L. McATEE

PHOTOGRAPHS BY G. T. HILLMAN

If tree-hoppers, or Membracidae, were large enough to attract public attention, they would be thought quite as marvellous in form as the olden dinosaurs. Some dinosaurs had remarkable horns, but most tree-hoppers are so equipped. Brought to the same scale their armament would surpass that of the dinosaurs because in many of them the horns equal or exceed the body in length. The horns occur in almost every conceivable position, some of the single types being directed upward and forward like that of the fabled unicorn while others are erect, and still others bent backward. Of the double horns some point obliquely outward like those of ordinary cattle and others are more directly sidewise like those of the Texas longhorns. The form also varies as widely as does the direction.

TREE-HOPPER OF DIFFERENT DESIGN

There are two thousand different tree-hoppers in the world; fewer than two hundred in the United States

All of these horns, as well as other projections to which we can hardly apply the term horn, are modifications of a single part of the adult tree-hopper's body, and the peculiarity of having this segment so modified is one of the most important characters distinguishing these hoppers from other insects. The bodies of tree-hoppers and of people are so different that it is difficult to compare them, but if we make use of a somewhat forced analogy, we may say that the horns and other outgrowths of the tree-hoppers come from a part of the body situated about like our

shoulder blades. It is well that we have the pictures.

This section of the tree-hopper's anatomy is known as the pronotum. There is one notum for each pair of legs, and the prolegs or front pair are jointed to the lower part of the same section of the body that supports the pronotum above. Recalling the body plan of so familiar an insect as the cockroach, the pronotum is that broader than long, somewhat elliptical, piece between the base of the wings and the head.

This part is of simple structure in the roaches but in tree-hoppers it assumes almost every imaginable shape. It is generally expanded and covers more or less completely the remainder of the body, sometimes projecting far forward beyond the head, or high above the true body, and often to the hind extremity of the insect. It may be closely investing, giving the hopper a seed-like appearance, somewhat more expanded and three-cornered like a beechnut, or greatly inflated and with veiny ridges like a peanut shell. The horned appearance of the pronotum of many membracids has been mentioned, but there are projecting appendages, scarcely to be called horns, on some of these creatures that are so moulded or branched that they are crudely tree-like, or even are so elaborate as to resemble a pawn-broker's sign. Others have bulbous and spined pronota that have been imagined to look like ants. In such cases, as the pronota of numerous species readily break off without harm, one of these insects, so to speak, might divide into two—a discarded dummy ant, and a still healthy and happy, even if less ornamented hopper. There has been much speculation about the utility of the bizarre structures of membracids, but that had better be left to the speculative. Need everything be placed on a basis of utility? Are the marvels of tree-hopper form any more in need of explanation than the comeliness of a flower, or the beauty of a sunset?

There are more than two thousand kinds of tree-hoppers in the world but fewer than two hundred in the United States. The family belongs to the great order of beaked or sucking insects, and all of them get their subsistence from the sap of plants. They are especially prevalent on young shoots and so tend to be abundant in second growth springing up in the wake of lumbering operations. Vines with copious juice, as grape and Virginia creeper, also are favorites with membracids.

ANOTHER TREE-HOPPER

This one belongs to the genus Telamona and shows the horn formation found in some of its fellows

THE BUFFALO TREE-HOPPER

This insect belongs among the economic insects because it lives on the juices of useful plants

Anyone wishing to make the acquaintance of tree-hoppers can count upon finding one of the rather ordinary looking species plentiful on black locust almost any time during the summer. One of the more striking kinds, with a stout pointed anterior horn and a conspicuous yellow streak on each side of the pronotum, also lives on locust. Rather common is a hopper with notched dorsal outline that may be found on the upper part of the stem of thistles, sunflowers, and joe-pye weed.

As in the case of most groups of plant-feeding insects, some of the species turn their attention to growths valued by man and so graduate into the class of economic insects. Those doing so in America include the three-cornered hopper, which damages alfalfa, clover, cowpeas, and other crops, and the buffalo tree-hoppers, which are injurious to similar plants, and also to orchard trees in the twigs of which they deposit their eggs.

If one examines a young stage or nymph of the buffalo

tree-hopper, one finds that the immature forms of these insects also have characteristic outgrowths. They have them literally from "stem to stern," while as noted before, the embellishments of the adults are usually confined to the pronotum. The nymphs share with the adults a defensive habit of sidling around a plant stem so as to keep it between them and an intruder. The young tree-hoppers are quite gregarious and are among the kinds of insects attended by ants. Using their antennae for the purpose, the ants stroke the nymphs and the latter exude a fluid which is eagerly consumed by their attendants. The young tree-hoppers are ant kine, as Fabre described the plant lice. There are several groups of insects so attended by ants, and the arrangement is not entirely one-sided as the ants to some extent guard their insect "cattle" against enemies, in some cases build shelters for them, and often move them to new pastures, that is, where the sap-sucking is better.

Tree-hoppers are overlooked by the public because of their small size and unobtrusive behavior, but as we have tried to indicate in this brief sketch, they are of great interest not only in structure but also in habits.

●

# FAIRY SHRIMPS

## GNOMES OF THE SPRINGTIME POOLS

BY L. C. PELTIER

He who gave the name of fairies to these fascinating little creatures must have been truly inspired, because, as they gracefully drift here and there among the dead leaves and twigs at the bottom of the pond, with their delicate plumes waving above them in slow undulations, the dark, icy waters seem transformed into a veritable fairyland.

Ruthless Science, however, soon dispels our flights of fancy and informs us that the fairy shrimps are not fairies, neither are they shrimps. They are crustaceans of the order Entomostraca, and, therefore, only a sort of cousin to the true shrimps and crayfishes.

Fairy shrimps exhibit a marked preference for quiet shallow pools that contain an abundance of algae and decaying vegetation. These, together with microscopic protozoans, constitute their food supply. For many years they have appeared each spring in large numbers in a small woodland pool near my home. A search in other pools for miles around revealed not a single specimen. Sometimes they make their first appearance early in January while the ponds are still covered with ice and snow. They often escape notice at that time because they are not more than one-eighth of an inch long, but they grow rapidly, and in about three weeks have attained their full size of about an inch.

The most conspicuous features of the fairy shrimps are the eleven pairs of plumelike appendages which, with a waving motion, propel them, always back downward, through the water. These appendages are not only organs of locomotion but they serve as gills through which the creature breathes. They are also used to collect food from the water and to prepare and pass it on to the mouth.

The sexes of the adults can be easily distinguished; the male has a hood-like formation on its head, terminating in a pair of claspers. The female can be identified by the absence of the claspers and by the egg-sac that is located near the last pair of swimming organs.

The eggs can be seen gradually to darken in color as they mature and frequently exhibit brilliant tints of blue and green. A peculiarity that may be noticed is the constant oscillating motion of the egg-cluster within the sac. The eggs are laid in the spring and remain in the mud of the bottom when the water dries up, hatching out when the pond forms again the following spring.

Some authorities claim that drying and freezing are necessary before the eggs will hatch. Certain it is that they hatch after being in dried mud for many years.

PHOTOGRAPH © BY HILEMAN

# ANCIENT SEAS OF GLACIER PARK

BY CARROLL LANE FENTON

**This is the first of a group of geological articles by Mr. Fenton. In this story of the past of spectacular Glacier Park he introduces us to some of the outstanding chapters of geologic history. In the articles to come he will deal more in detail with some of these stories of ancient days mutely told in the rocks.**

IN NORTHWESTERN Montana lies a wonderland of brilliant mountains. Peaks of red, yellow and green rise abruptly from the plains. Lakes stretch from rolling glades into deep, rock-walled chasms. In valleys, fields of flowers bloom. On the heights, winds sweep the ice of sixty alpine glaciers. They, and greater ones of the past, give their name to Glacier National Park.

The region is one of rich, beautiful contrasts. Red rocks frame green meadows; pinnacles overlook plains. Valleys bear forests of cedar and pine, while on passes the stunted alpine shrubs rise less than six inches from the ground. Mountain goats climb upon crags whose ledges are floors of vanished seas.

But how can sea floors be found on peaks? By what hocus-pocus of Nature can ancient rocks rise above young, building the snowy ranges of the Rockies upon younger strata of the plains?

At first, such questions suggest chaos. Yet, from things seen by the trails, orderly answers soon appear. Quickly they unite in a sweeping tale that recounts the building of rocks and land, the struggle of simple things to live, the events of that remote past when North America was young. It is a narrative that is well worth the telling.

The story begins, we find, with the deposition of bedded rocks. Many peaks, like Shasta and Rainier, are hardened lavas of early volcanoes. Others, such as the Black Hills, are granites uncovered by uplift and wear. But, except for two minor formations, the rocks of Glacier Park are not lavas, while only one thin formation suggests the crystalline structure of granite. All others are hardened sands or muds, or minerals that sank bit by bit until they formed layers of stone. Most of them settled beneath the sea, and even on high trails we find rocks that once were salty marine muds.

That sea spread southward across the West during Proterozoic time. This was the second of the five eras into which geologists divide the past. Translated into figures, it began about 1,450,000,000 B. C. and lasted 900,000,000 years. Although the Montana sea came near its close, the rocks on these mountain sides are at least 600,000,000 years old. Some are a good deal more than that, their age adding its charm to scenes in which lakes, peaks and glaciers appear.

So far as Glacier Park is concerned, history begins

A LUMP OR "PILLOW" OF SUBMARINE LAVA

Note the fissures visible perpendicularly. These are the tubes from which the steam generated by the suddenly cooling lava emerged and left its tell-tale trace

when the sea was surrounded by low, sandy shores. Beneath the water lay soft, gray mud which here and there bore banks of the simple water plants called algae. In their jelly-like masses they deposited lime, thus building domes and columns of rock which were so closely crowded that they formed solid beds. Winds often blew from the dry shores, dropping gravel and grains of sand. These sank into the gathering muds.

Pausing beside a waterfall, we find ledges of fossil plants peppered with gravel and sand dropped by winds of long ago. Climbing, we find ourselves in a spot where Blackfeet tribesmen used to camp, and where we pitch our own tents amid a clump of limber pines. Near us are lodgepoles and firs, while harebells, paintbrush and monkey flowers crowd almost to our canvas doors.

Cliffs of grayish green rise from the meadow, proof that rivers stopped bringing lime, and piled layers of mud on the floor of the sea. They brought billions and billions of tons, until three thousand feet of rock were formed by closely-packed grains. How long that took, we do not know. The few hints that can be found suggest a mere two or three million years. Let us not be too particular.

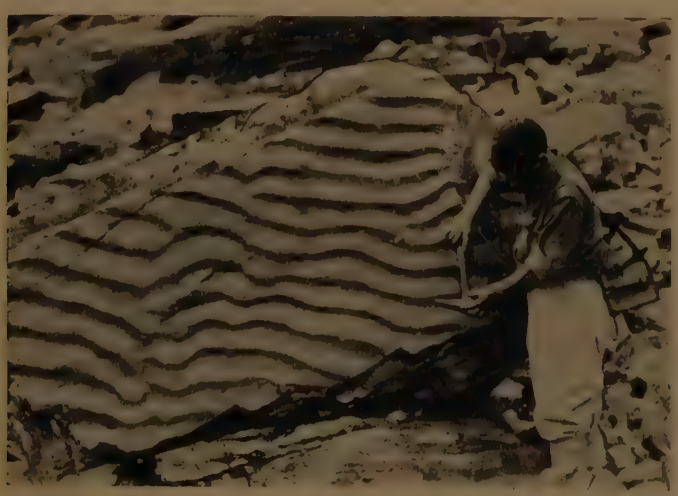
Above the green mudstones lie red, ushered in by sandy beds. Those sands mean that lands were high, sending coarse fragments down swift streams that reached tidal flats or the sea. Above the red shales rise cliffs whose rocks bear queerly weathered designs in limestone and dolomite. On peaks near the Continental Divide, these limestones are four thousand feet thick. This means that the sea floor sank that much while these strata were piled up on it.

These varied rocks tell the great events of the time when the West was a sea. But where shall we trace daily happenings on beaches, bays and adjoining lands?

To discover these we take a trail that leads through lodgepole pines and firs. Berry bushes cover the ground; a porcupine waddles away with his spiny tail ready for attack. We climb a low, grassy cliff to a place where "slide rock" covers the slope and snow fills a sheltered ravine. Our guide searches the chips of rock till he finds little cubes of sand where there once were crystals of salt in dried mud. If we grant that water once covered the West, we now are sure it contained salt.

We meet with waves, currents and storms in the tumbled moraine of a tiny glacier at the foot of what maps call Pumpelly Pillar. Our first find is a block of criss-crossed beds that once were red mud and white sand. They were dropped by shifting currents and waves, perhaps but a few rods from shore. Cross-bedding, geologists call such marks, accepting them as proof of shoals whose waters no human being has seen.

Our next find is a pinkish slab crossed by even-



A RECORD OF AN ANCIENT CURRENT

The geologist measures ripple marks made by currents some six hundred million years ago

BOWMAN VALLEY WAS DUG LONG AGO BY GLACIAL ICE

Looking from the trail above the valley we see, in the distance, a remnant glacier and a rarely perfect example of a "horn peak"

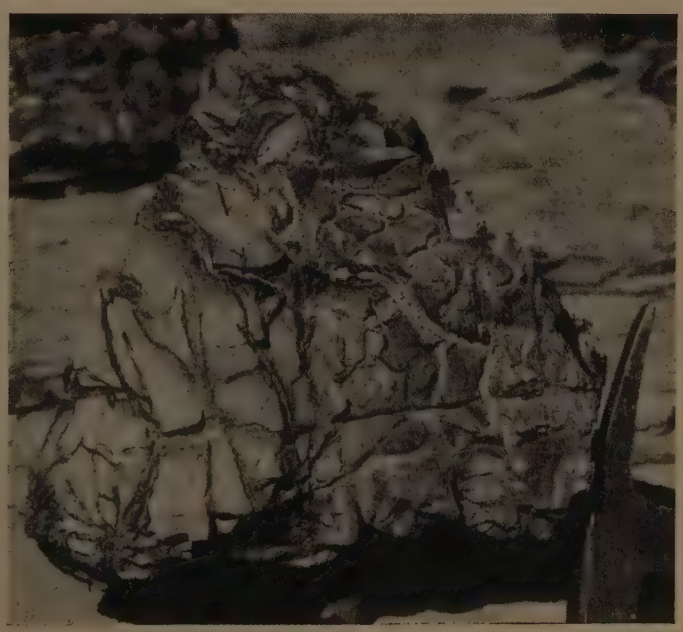
sided ridges. These ridges probably suggest waves. "Yes," our geologist replies, "waves made those marks on wet sand. When the wind changed, their direction changed too, so they started to build a new set of marks across those that already were formed. Then came a few days of calm before the wind sprang up again. The surface was buried under sand and preserved as it hardened to stone.

"Why do I say these were made by waves? Because waves now make ripples whose sides are equal, like these. Current ripples have one side steep. Look at yonder large red slab if you want to see just what I mean. If it lay in place, high on a cliff, I think you'd find that the steeper sides lay toward the southeast. That means the current flowed from the northwest, as it did at several places I've seen."

But what are these red chips and lumps scattered among coarse, white sand? Those chips were partly-hardened mud, torn up and dropped again by waves; but the red lumps seem to have been rolled over and over like snowballs. When storms reach sandy coasts today, they bring up balls of mud like these and drop them on sandy flats near shore. These early "storm rollers" are records of gales that swept the Proterozoic sea.

Yonder lies a slab of rock covered with "fossilized" mudcracks. Perhaps the sea water drained away; perhaps low, marshy spots were laid bare, their muds drying in the sun and breaking into irregular blocks. Unlike the muds of fresh water ponds, the edges of these blocks turn down, as do those of drying salt-water muds.

But water again returned, bringing new layers of mud which covered the mud-cracked beds. Earthquakes shook the shallow sea; near the shore, ranges of hills appeared from which rivers brought coarse sand into valley flats and shoals. Rains fell and hailstones beat down, digging pits in the muddy sands, which soon were covered and



A ROCK THAT TELLS A STORY

Even lime mud dried and cracked at times when the ancient sea withdrew

THE ANCIENT ROCKS CRUMPLED AND BROKE

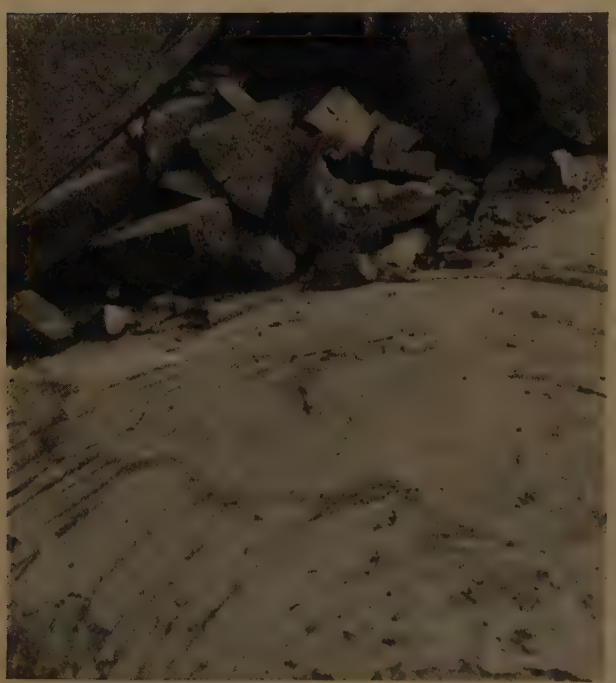
This is what happened as they were shoved forward along the Lewis Overthrust. Chalk Age beds lie at the foot of this mountain under the forests of lodgepole pine

preserved. Yonder some of them are today, beside the trail to a high, cold pass.

As the hills were worn down, limey muds again covered the bed of the sea. We see them now in the limestone cliffs that form much of the Continental Divide. Those cliffs may be reached by well-built trails, with stops at tent camps and log chalets. An easier route is the motor road along the western edge of the plains. For miles it follows the "Travois Trail" on which old-time Indians rode to hunt and war. Looking closely, we may see the ruts dug by dragging tipi poles on which were loaded skins, clothing, food and even little Blackfeet boys.

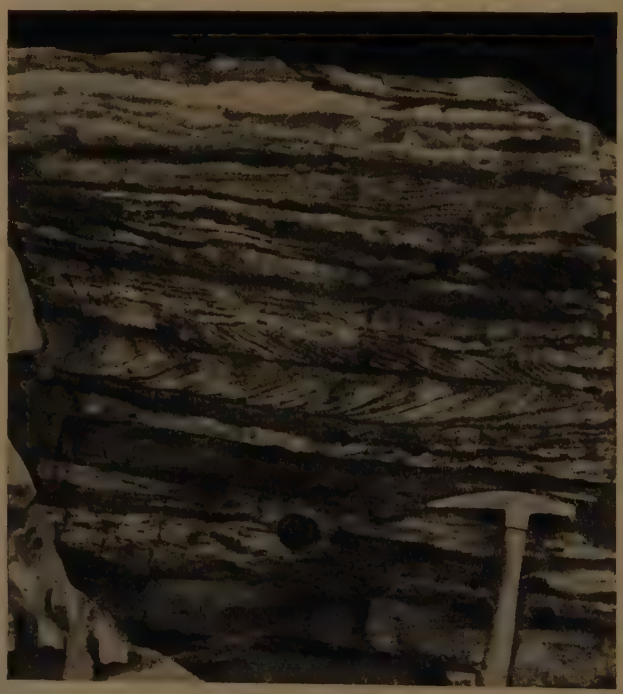
Turning to Swiftcurrent Lake, we find ourselves at the hub of trails leading to glaciers and lakes surrounded by limestone walls often far too steep to climb. Four thousand feet of rock, recording one epoch of our sea!

High upon these jagged cliffs is a dark band between borders of white. Once a molten, lava-like mass, that dark rock worked up along cracks and spread out along weak beds in a flat sheet or sill. As the lava cooled, it grew hard, while its heat baked the dark beds above and below into an impure whitish marble. Just when this happened, no one knows. The lavas may have burned their way upward while the Rockies were being built—



FLOW LINES IN HARDENED LAVA

The layman would think this odd but the geologist knows quickly the story it tells



BEDS OF SAND AND MUD LAID DOWN IN SHOALS

Their crossed layers show the shifting currents and waves. The dark balls were washed up in storms

or they may have come in those early days when Montana still lay under the sea. Submarine eruptions did occur, mingling their greenish lavas with muds along the present Divide.

As the epoch of eruptions drew near, the sea bottom shook and grew hot. Soon it broke into long cracks from which sheets of lava poured and rolled along beneath the sea. Here and there, they tore up great chunks of shale, engulfing them in steaming, hot rock. In other places, they spread across mud-cracked flats, killing the simple marine plants that made those flats their home. Cooling, the lavas formed lumps and ropes perforated by irregular tubes through which bubbles of steam escaped. Broken lumps, or "pillows," show these tubes, while slopes laid bare by glacial ice allow us to trace directions of flow as the lavas spread out from their cracks.

The Proterozoic era closed when the western sea finally drained. Mountains were built in the south, hills in Montana and Canada. Winds, rains and rivers wore them down and their remnants again were submerged by advancing Paleozoic seas. They, in turn, gave way to lands on which dinosaurs with armor and beaks roamed swamps bordered by forests of palms. Yet they did not wander in peace, for Chalk Age waters drove them away and covered the forests with beds of shale. While these changes were taking place, 470,000,000 years passed across the face of the earth.

© BY HILEMAN

THE HEAD OF ANCIENT GRINNELL GLACIER CUT THIS WALL OF ROCK

The present glacier lies above, its melting ice making waterfalls

Then hills once more began to grow. Under a mighty thrust from the west, rocks began to crumple and bend. Harder, ever harder, it pressed—and though hard rocks can withstand great force, there comes a time when they yield. Pushed hard enough, they crumple and fold; bent and pressed still farther they break.

That is what happened in Glacier Park as the rocks were pushed toward the east. At first, broad arches appeared; arches were crowded into folds; folds that could stand no more at last broke, each break accompanied by earthquakes. Amid more shocks, the rocks were shoved up—up for thirty thousand feet and eastward thirty to sixty miles across crumpled strata below. When they came to rest, they formed mountain ranges upon Chalk Age shales and sands of the plains.

The breaks along which these mountains moved is the famous Lewis Overthrust. Its front lies at the foot of steep cliffs where the ranges give way to the plains. We crossed it when we entered the valley in which we first pitched our tents: we crossed it again on the road to Swiftcurrent Lake and the Divide. Yet we hardly realize what it means until we follow the trails and see crumpled, broken rocks miles away from the plains. Then we remember that those rocks were once muds settling beneath a shifting sea—and we grasp the might of the processes that have turned these muds into peaks.

Dinosaurs lived here at a time when the climate was almost tropical. As mountains appeared, the weather grew cold. Snow at last began to fall—more snow than the summers could melt. Gathering on protected slopes, it slowly packed into fields of ice. Then that ice began to move, and soon was grinding down toward the plains.

Thus glaciers began their work—work that dug the basins of lakes and steepened the slopes of ridges and peaks. At their heads, they broke away blocks of rocks, which worked their way into the ice, where they gouged and scraped at its bottom and sides. In the valley where our trails begin, that ice was two thousand feet thick. What chance had mere limestone and shale against such a rasp as that?

As the climate finally began to warm, glaciers slowly melted away until only remnants remained. Sixty such remnants still survive: relics of mighty streams of ice that shaped the scenery of the Park.

Yet glaciers, important though they were, did not make these mountains unique. For that, we must credit the early sea in and near which their rocks were formed during Proterozoic time. Rich in red, green, gray and buff, its rocks give beauty to passes and cliffs. Richer still in their tales of events, they bring to life a past so remote that we hardly can conceive its age. Waves, winds and rains have not changed: muds and sands of shallows today are much like those of ancient times. Even life is much the same, at least among seaweeds, worms and simple plants that build masses of lime which gather into layers of stone.

The earth is a place of constant change—but the forces upon it remain the same though seas become mountain peaks, and rolling lavas are ice-planed land.

In this article the reader has found etched a background setting forth the geological history of Glacier National Park, that great national playground in Montana set aside by a wise nation that it may be enjoyed by all of the people. Necessarily many of the fascinating stories told by its rocks and its glaciers, its valleys and its majestic mountains have been only lightly touched upon here. Inevitably, also, many of the less spectacular relics left in this region in past ages have been passed by in the broad sweep of this story. Plants, animals, shellfish, corals and sponges—all were found here ages ago, and the fascinating records that they left for us of today to read provide the subjects of articles that are to come.

SOFT-WOOD OR "GREEN" CUTTINGS
Ready for insertion in the rooting medium lower leaves having been removed

# NEW PLANTS FROM OLD

BY F. F. ROCKWELL

PHOTOGRAPHS BY THE AUTHOR

THE METHOD of obtaining new plants most generally employed is to grow them from seed. But growing from seed often fails at one most important point—it does not give us an *exact* reproduction of the parent plant. Then, too, there are many things which require a long time for development from seed. Still others do not produce seed.

Fortunately, under such conditions, the gardener has available another means of reproduction. He can take a piece of the old plant and, by suitable methods, induce it to develop into a new plant—a counterpart of the one from which it was derived. Results are, in many cases, immediate. Often a new plant may be had, in bloom, in a few weeks from the time the cutting is made!

This making of new plants without the use of seed is called "vegetative" reproduction. The simplest form of it—one which any amateur soon learns to use—is merely to separate the old plant into two or more parts and replant each part. This is known as "division." This and similar methods of increasing plants will be discussed in a later article. The method of increase we are concerned with just now is somewhat more complicated, but by no means beyond the use of the average amateur gardener. It is known as plant propagation by means of "cuttings."

What is a cutting, and how does it "work"? A cutting is a severed portion of a plant capable of developing roots and top growth and eventually forming a complete new plant. Almost any amateur gardener is familiar with the practice of "slipping" plants—breaking off branches or shoots of such things as geraniums or roses—and placing them in soil to root. A bit of ivy or a sprig of pussy-willow used for decoration often quickly forms roots in the water in which it is placed. All of these things are, in a sense, cuttings. The chief difference between them and the cuttings of the professional florist or gardener is that the latter are cut rather than broken from the plant and are made for the specific purpose of producing new plants.

As to how the cutting works, just what makes it "behave that way," that is a mystery which not even the scientists have yet solved. In a sense the growth of cuttings is even more astonishing and intriguing than that from seeds. In a seed we have something the whole end and purpose of which is to produce a new plant. Nature designed it with that specific objective in view. In a cutting, however, we have a bit of plant which, under certain conditions, assumes functions not at all normal to it.

This transmutability of the parts of plants is a marvelous thing. It is as though one could cut off a finger, keep it for a while under certain favorable conditions, and then have it develop legs and feet at one end, arms and a head at the other! One remarkable fact in connection with cuttings is that, of the piece or section removed, the part which was lowest on the plant as it grew invariably produces roots, while the upper part produces leaves and branches. This is true even of cuttings made from roots, and even though the cutting be planted upside down this characteristic is unaltered. But if we take two cut-

FIRM-WOOD CUTTINGS PREPARED
These include box, Japanese euonymus, honeysuckle and juniper

SPECIMENS OF HARD-WOOD CUTTINGS
These are usually planted deep, only two buds (or pairs) being left above ground. The rose cutting at the left has been taken with a "heel"

tings from the same shoot or branch, one directly above the other, the upper part of the lower cutting will produce leaves, and the lower part of the upper cutting (from exactly the same point on the parent plant) will produce roots! Figure that one out if you can, and send your solution in to the puzzle page editor.

Although the exact whys and wherefores of cutting growth remain a mystery, their practical use by the gardener as a means of increasing plants goes back far beyond any records which we have. Certain facts concerning them were discovered centuries ago; others we have but recently found. These recent discoveries have made it possible to secure much more certain and uniform results than were obtained formerly, and have proved very valuable to the amateur gardener as well as to the commercial grower. Concerning them we shall have more to say later on.

Some plants grow from cuttings much more readily than others, but the number of things which can be successfully reproduced by this method is being constantly increased as we discover their particular requirements. Some authorities are convinced that practically all plant life is capable of being reproduced by means of cuttings, and that it is only a matter of research and experiment before we shall be able to handle those which have so far proved recalcitrant. However, what chiefly interests us here is what practical use the amateur can make of the art of cuttage in its present state of development, and how to set about employing it.

Since the buds or "eyes" on a plant are naturally the focal points of new growth, they play an important part in propagation by means of cuttings. Cuttings of most plants develop roots most readily at an eye or a joint; many cannot be induced to form roots elsewhere. This however is not a hard and fast rule. A sprig of willow or a piece of ivy partly immersed in water throw out roots all along the submerged portion. A dahlia cutting taken between the joints will form a new plant and flower freely, but it will not develop a tuber as it does when rooted at a joint. As a general rule, to which there are few exceptions, the lower end of the cutting should be taken *at or near a joint;* and there should be an eye or eyes a little below the upper end.

There are several distinct kinds or types of cuttings. The beginner should learn to distinguish these. A little practice will enable him to succeed in making any of them, and, at various times, he is likely to find use for all, even though some are much more generally employed than others.

These various types are known as soft- or green-wood cuttings; hard-wood cuttings; firm-wood cuttings; leaf cuttings, and root cuttings. (The term "wood" in the sense here used is a technical word, and does not necessarily imply a woody texture.)

Soft- or green-wood cuttings are made from the actively growing shoots of such soft wooded plants as geraniums, begonias, coleus, heliotrope, snapdragon and many other house and garden plants which do not have a fully dormant period. Hard-wood cuttings, as the name implies,

HANDLING A SMALL NUMBER OF CUTTINGS
Saturated peat moss in the center gives constant moisture to the sand and peat moss rooting mixture

COLD FRAME ROOTING
This is convenient for handling green-wood and firm-wood cuttings rooted in the summer

are made from fully ripened or hard wood, usually in a dormant state, and are employed in the case of such things as deciduous shrubs like privet, garden and climbing roses when in dormant condition, and trees, like the willow and tamarisk, which root readily. Firm-wood cuttings are half way between the two preceding types. They are made from wood which has completed growth but has not yet become really "hard." They are used in the propagation of many shrubs such as the broad-leaved evergreen, hydrangeas, weigelias and roses. All these three types of cuttings are quite distinct and handled in different ways, yet there is no absolute line of demarcation between them. Ordinary garden roses, for instance, may be propagated from soft-wood cuttings taken while the plants are still in active growth; from firm-wood cuttings taken late in the season when the wood has ripened but still retains its foliage; or from hard-wood cuttings taken when the plants are fully dormant.

Leaf cuttings have a much more restricted use, but it is extremely interesting to work with them. They are used almost entirely in the case of thick or succulent-leafed plants such as the fancy leafed-begonias, cactuses and other succulents. Root cuttings, while frequently employed by the commercial grower, are of comparatively little use to the amateur who is seldom interested in securing any great number of plants. They are used mostly for species which have fleshy roots and tend to send out "suckers."

The first requisite in success with cuttings is careful and proper preparation. Only clean, healthy material should be employed. The knife used for cutting must be kept keen. The cut surfaces almost invariably heal or "callous" before roots are formed, and crushed or torn bark or tissue, resulting from careless work or the use of a dull blade, is quite likely to decay instead of making a clean, normal callous, with the resultant loss of the cutting.

In making green-wood cuttings the important thing is to select wood of just the proper degree of ripeness. With a little experience one becomes able to determine this by the "feel" of the wood as it is cut, but the beginner will find helpful what is known as the "snapping test." If the shoot or branch from which the cutting is to be made is bent at right angles it will, if in proper condition for making the cutting, snap or break off much like a brittle bean pod. Insufficiently developed young growth which bends without breaking is too soft to make a good cutting; and old fibrous wood which crushes and doubles up without breaking is too hard. Soft-wood cuttings are usually made from two to five inches long because this is a convenient size to handle. Often they are made from the tips of new growth, but in many cases it is possible to get several soft wood cuttings from a single shoot or branch. Cuttings made with a "heel,"—or a bit of the main stem from which the side shoot is taken—in some cases root more readily than others. The lower leaves are removed from the cuttings to allow ready insertion in the rooting medium, and large leaves on the upper portion may be cut back to reduce evaporation.

Hard-wood cuttings from dormant wood are generally made considerably longer—four to ten inches. If the fully ripened leaves still adhere they are stripped off for the en-

AFTER A FEW WEEKS OF ROOTING
These soft or green cuttings are now sufficiently rooted and are ready to be placed in pots

tire length of the cutting. When such cuttings are prepared in quantity they are usually tied together in bundles of twenty-five or fifty for easier handling. The amateur will find it convenient to tie several cuttings of a single variety together, or to hold them with a rubber band.

Firm-wood cuttings are made in much the same way as hard-wood cuttings, but the foliage is left on and they are given the same treatment as soft-wood cuttings, described later. The long cuttings of roses with foliage attached, covered with an inverted glass jar, are a familiar example of firm-wood cuttings.

Leaf cuttings are made in several different ways. They may merely be the fully matured, ripened leaves laid flat on the rooting medium and held down with pegs or pebbles; they may be cut in two lengthwise and inserted on edge; or they may be cut into triangular pieces, each having as its base a part of the centre or one of the main ribs, these pieces being inserted upright like soft-wood cuttings.

Root cuttings are taken from roots in firm condition but still in active growth, these being cut into sections one to three inches long.

The cuttings having been prepared, the next step is to supply them with conditions which will induce growth. The factors which are important in this connection are: moisture, both in the medium in which they are to be rooted and in the surrounding atmosphere; temperature; light; and protection from destructive fungi and bacteria. In other words, the same conditions in general which favor seed growth, and which were described fully in the article on seeds in the February issue of this magazine, also favor the growth of cuttings.

DON'T LEAVE CUTTINGS TOO LONG
The geranium at the right is in much better condition for potting than the one at the left

Some cuttings root so readily that they are merely stuck in the soil and left without further attention. Privet hedges are often started merely by inserting clippings of small branches in a row where the hedge is wanted. Good sized branches of willow stuck in the ground and kept moist will take root and grow. These, however, are exceptions to the general run.

CLINGING TO ITS PEAT MOSS
This cutting illustrates the affinity for this factor in the growing material provided

Formerly clean, gritty sand, rather coarse (commonly known as "builders' sand" because suitable for cement and mortar work), was the material almost universally used for the rooting of cuttings of most kinds. It had the advantage of allowing surplus moisture to drain off rapidly, and of being comparatively free of disease organisms. Recent experiments have demonstrated that fine granulated peat-moss is a better rooting medium than sand for many types of plants, particularly those of the ericaceous group, such as azaleas and other broad-leafed evergreens; and that a half-and-half mixture of sand and peat-moss gives better results than sand alone with most other things. The advantages of peat-moss are that it holds moisture longer, without being wet; that it is entirely sterile; retains a more even temperature; and, in addition, seems to possess some peculiar capacity not wholly understood, for the development of root growth. A half-and-half mixture of peat-moss is much lighter to handle than sand alone, a matter of considerable convenience to

AND HERE ARE TWO BRAND NEW PLANTS
The dusty miller at the right is ready for repotting, as indicated by the network of roots

(Cont. on page 149)

KEEPING QUIET WHILE A HAWK CIRCLES OVERHEAD
Note the protective color of the bird which makes her hard to see against the natural background of the native woods where she makes her home

# A FRIENDLY PARTRIDGE

## THE STORY OF A RUFFED GROUSE THAT REALLY MADE FRIENDS

BY H. A. MACKINNEY

IF I did not have the pictures to prove it I might hesitate to tell this story. Hunters who have had experience with this elusive bird might otherwise be expected to listen to it with lifted eyebrows. Lovers of wild life might think that I was spinning a yarn, or had mistaken some barnyard fowl for a partridge. But it is a true story and the most fascinating wild life experience I have ever had.

The ruffed grouse or partridge is plump, about the size of a bantam hen, but with shorter legs. It has light meat like a chicken and is very good food. For this reason it has many enemies by night as well as by day; in the air as well as on the ground. Its natural enemies are the fox, domestic as well as wild cat, numerous hawks, weasels, skunks, owls, etc. Consequently it has to be very wary and constantly on the alert, as it could be easily seen if it did not keep under cover. Hence it is only found in the thickest woods where there is plenty of underbrush and briers. On rare occasions it might stray for a short distance into a clearing for some special food or gravel. It is therefore as shy and wild a bird as one finds in the woods.

Nature has helped the partridge in being inconspicuous by giving it a coat of feathers of all the different shades of brown like the oak leaves, spotted and striped with black, so that it is very difficult to see one when at rest in its native cover, even if you knew about where to look. Self preservation is its greatest problem and it solves it pretty well. The camouflage is perfect.

OUT FOR A STROLL IN THE WOODS
Our bird walking along a woods path. She always was sorry to see us leave after a visit

Why then did this bird entrust its life with a stranger? Why did she seek human companionship? Was it curiosity? Was she lonesome for some friendly companion that she could trust? She has to be very careful in the selection of her associates and she was in this instance, as the following story will reveal.

The young animals and birds in the woods are warned by their mothers of the enemies that they must avoid. This partridge has a very distinct warning of danger which she gives when a dangerous enemy is approaching. She will put her head on one side at the sight of a hawk and utter a, "Ker", "Kerr", "Kerr", "Ker-r-r"; will hug her feathers very close to her body, to make her look as small as possible, and if the enemy is too near, will hide in the thick leaves or undergrowth, until he has passed. Then she will be very cautious about coming into view again. I noticed that when this bird gave this signal in the woods on one occasion, that all the small song birds that happened to be in the vicinity, disappeared from view as if by

magic. This indicates that they understand her warning.

These cunning traits are the results of the strongest instinct in all wild life—self preservation. This bird is so shy, timid and wild, that it cannot be easily raised and tamed, if at all, in captivity, as can the pheasant and quail. The partridge ranges the woods of Canada and the northern United States following the Alleghenies as far south as Georgia in the East, and northern California in the West. The drumming of the male bird as he stands on a log or a stone is one of the commonly known traits, but it has others that are most peculiar and hard to explain. For example, the female has to steal away from the male to make her nest, because if he should find it he might break the eggs and tear up the nest.

SITTING ON JOE'S HAT

She would roost on hat or shoulder while we talked and if she wanted attention would take a peck at an ear or the back of the neck

As soon as the little ones are hatched, they can run fast and seem to have more than the usual instinct for taking care of themselves. They will hide quickly and remain hidden for some time, if an enemy is near. If you happen to get near a brood, the mother is apt to come fluttering about in front of you and feign being badly wounded, keeping just out of your reach, but giving you the impression that you could easily catch her. Sometimes she will limp, or hold one wing down as if it were broken. After you have chased her off for a few hundred feet, she will rise up, fly away and leave you. In the meantime the brood have had ample time to scurry off to safety. If an enemy should get too close to her young, she would defend them with her life. The little ones learn to fly young, and are then taught to roost off the ground in the trees, where foxes and other enemies cannot get them.

In the daytime the young birds are apt to be trailed by their enemies. Realizing this, the mother bird usually follows along behind her brood, so as to be able to defend them from an attack from the rear. She is a powerful and quick bird, with much courage and has a strong beak. She can put up a pretty stiff battle and is usually the victor.

But let us get to the story of one different and individual partridge, an entirely wild bird. It began one day in September, 1932, when my friend Joe had gone into the woods to do some work. While he was driving his beach wagon along a woods path, a partridge suddenly flew straight down the road, right towards the car, then veered off to one side as it came near and disappeared into the brush. A few days later the same thing happened. This seemed strange; but when it got to be a regular occurrence every time Joe went into the woods with his car, he made up his mind that the bird wanted to meet either the automobile or himself.

The next time she appeared, he stopped the car, got out and approached her. She did not seem frightened, although she did not let him get close to her. He went back to the car and as he started away, she followed along parallel to the road, running in the brush for about fifty yards.

From then on, he would bring to her different kinds of food. He discovered that she did not care for grain, but was particularly fond of peanuts, preferring the raw ones to those that had been baked. She gradually became tamer and would be waiting for him at the same place in the woods path near an old stone wall, every time he went there.

When the hunting season opened, no one was allowed to hunt in that vicinity, as this friendly bird had established herself firmly in the good graces of everyone who knew about her—particularly Joe and his wife. They had lost their pet dog just at the time that this partridge had come into their lives, and being very fond of animals, it meant a good deal to them.

This, in my opinion, accounts for her having no particular fear of man, as she has never known him as an enemy. It also would seem to prove that she was hatched in the spring of 1932, because if she had gone through a hunting season in that particular section, where a good

deal of hunting is done each year, she certainly would not have looked upon a man as being good company, unless she was contemplating suicide.

When it got colder and the food became more scarce, the bird began to appreciate more and more the food that Joe brought her, as well as the companionship and change that his now daily visits brought into her narrow life. She was now so tame that she would eat out of his hand.

One day as he was standing by a pile of cord-wood, she jumped up on the pile, came nearer and nearer and out of sheer curiosity, hopped on his outstretched arm. He fed her and played with her and finally caught her in his hands. She struggled frantically and showed plainly that she did not like it. When he liberated her, she flew off at top speed into the thickest cover, plainly showing her displeasure.

THE AUTHOR OFFERS AN APPLE

The partridge likes apples and the author feels that one was the beginning of their friendship

Day after day Joe returned to the accustomed meeting place, sometimes with the motor, which she had always liked, and sometimes afoot. She would not come out from her hiding, even when he called and whistled for her as he had been in the habit of doing. Finally, after three weeks of persistent daily visits, he saw her at a distance, standing still, looking at him disdainfully. She was cool and would not come very near him for days. She seemed to be trying him out, to make sure that he was not an enemy like some of the other "animals" of the woods.

An animal has the faculty of sensing an enemy. This is noticeable even in the dog or domestic cat. How well does a dog know whether or not you like him? With a game-bird, as keen as a partridge, this faculty is marked.

After days of serious calculating, she concluded that Joe was a real friend and had meant no harm, the day he picked her up in his hands. She was quite right, because no man could be more trustworthy than he, or fonder of animals. Thenceforth she became tamer than ever, and seemed to be more dependent upon his companionship. She did not object to his picking her up and seemed to delight in lighting on his head, when in a playful mood.

She did not like strangers. If visitors went up to the meeting-place with Joe, it would be some time before she would appear, and then at a safe distance. The first time I went to see her it was forty minutes before she came out of the thicket, and then I had to stand off about fifty yards to see her doing her tricks, playing with Joe.

After a few visits, she seemed to have figured out that as I was a friend of Joe, I would doubtless be kind to her. She seemed to know at once that I was fond of animals and wild life, because she played with me like a little puppy-dog, would sit on my arm while Joe and I were talking together and if we did not give her the proper amount of attention, would remind us of it by pecking at the back of my neck or pinching my ear. Her bill is strong and sharp and sometimes she would break the skin.

Perhaps an apple had something to do with her making friends with me so quickly. The first time I got really near her was a cold day in the late winter when food for her was none too plentiful. Knowing that partridges are fond of apples, I brought with me a Mackintosh Red. She was sitting on Joe's arm. As I went near her with the apple, she reached out and, with a quick movement, took a good bite. She liked it so much that when I went near her and held the apple in my right hand, just above my extended left arm, she jumped over on my left forearm and began to eat as if she enjoyed it. From that time I have enjoyed her confidence and she will come and visit with me without any fear.

I confess that I have hunted partridges for more than thirty years and have studied their traits from a hunter's viewpoint, which is very limited. About all a hunter sees of the bird is when she whirrs up out of a dense thicket, he fires at her and either kills or misses; more frequently the latter. He knows by observation the kind of country the birds frequent, the kind of food they like, what time of the day they are most apt to be feeding and a few essentials like that; but what opportunity has a hunter to know that this bird likes to play?

In my many trips into the woods to see this grouse of ours, she has always shown a desire to play, although she likes to be rough. Probably this is because she is so strong and active. For example, if I rustle my hand along the ground, through the leaves, she will pounce on the back of it, pull the skin and twist it with her beak and perhaps beat my wrist and arm with her wings. This was interesting as it showed her courage, strength and agility and demonstrated what might happen to some enemy that might attack her or her young. From my observations, I believe that a rat, a weasel or any small animal would have a pretty rough reception in attacking a full-grown partridge.

Another illustration of her courage, or, possibly, self control, was shown when Joe took a birch rod about

seven feet long and struck the ground hard, first on one side of her and then on the other, not more than two feet from her and she would not move. She pretended not to notice it. He then switched it back and forth, just over her head, with such force that it made a whirring sound, but she was not at all afraid, apparently accepting it in the same spirit in which it was offered—just play.

She loves to play with a felt hat on the ground. I have seen her dash after Joe's hat, scaled along the ground, jump on it, bite and strike it with her wings and literally "beat it up". She also likes to have a hat put over her. She will stay under it, as if hiding, for some time and then throw it off when she wants to come out. Sometimes, strange to say, she will walk off with the hat over her.

Suppose someone should offer a large money prize to anyone who would go into the woods of southern New England and tame a wild partridge. How would a person start about the task? What inducements could he offer to get the bird to come near him? It would be a very difficult assignment and one that nobody familiar with the habits of this bird would care to undertake. I am inclined to believe that the prize would never be won, until some freak bird should take a strong notion, as did this one, that it was determined to make friends with a human being. In other words, the desire to make friends will also have to be on the part of the partridge.

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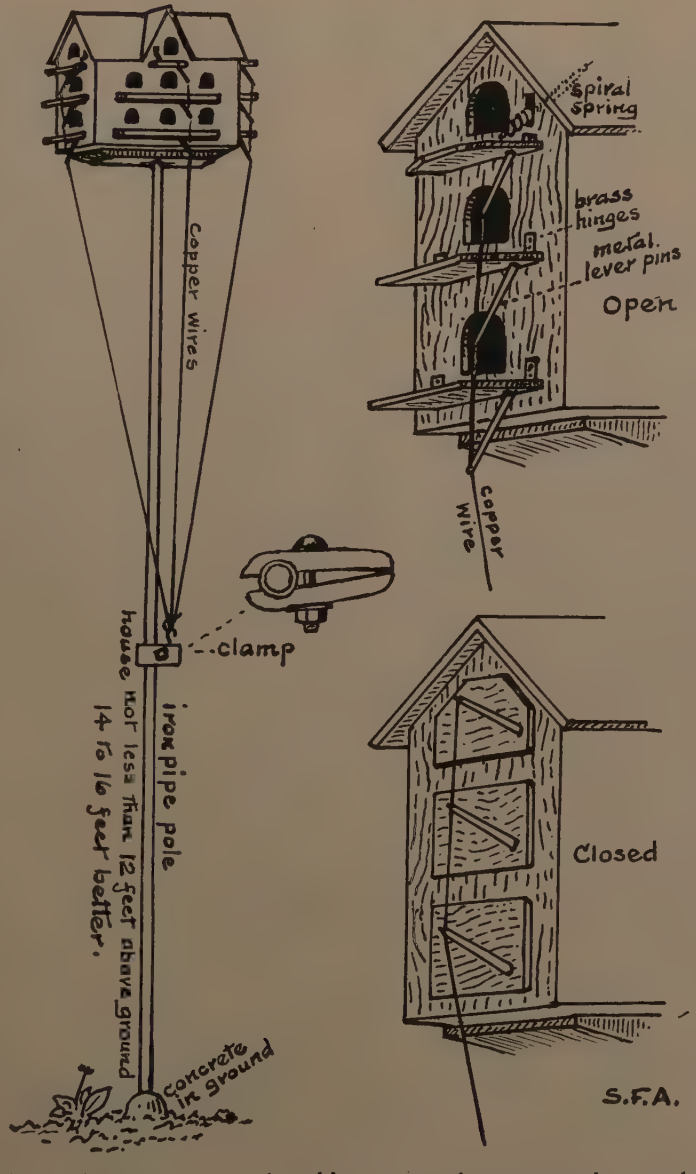
# ENCOURAGING MARTINS

BY S. F. AARON

THE European sparrow and the starling roost in nesting holes and crannies, occupying them long before the native birds arrive, and making them distasteful to the more dainty species. For this reason alone the purple martins have been driven from most localities in the northern and middle tier of states and from lower Canada. Where the foreigners are excluded the martins always remain or return.

There can be but two ways to prevent the sparrow and starling interfering with the martin. One is the persistent and often time-taking use of the gun which most Nature lovers refuse; the other a mechanical method of closing the martin houses against the occupancy of the undesirables.



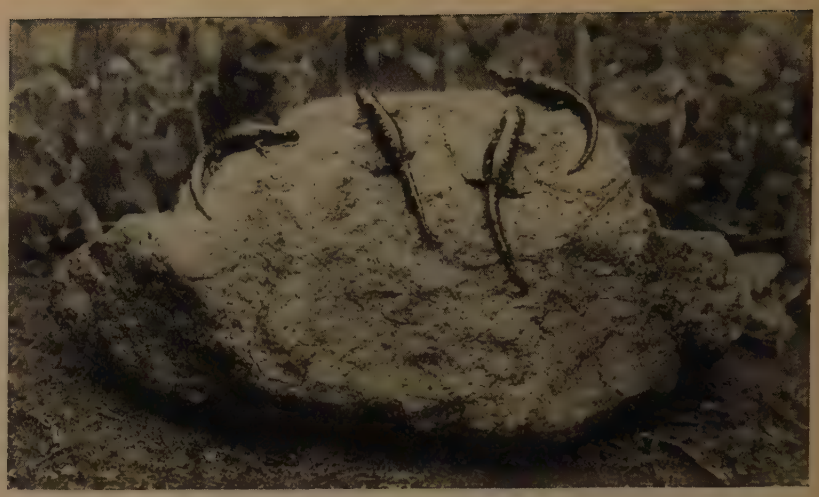

The accompanying illustration shows a by no means complicated device that anyone handy with tools may construct in odd moments, and that will, by simple attention at the proper times, insure open house to the friendly, cheerily-warbling cousin of the swallow that always prefer, as do all its kindred, to nest in companies and colonies

Hinged doors to cover the entrances to the martin house are closed with a stout brass spiral spring and there are projecting arms on these doors to which is firmly fastened non-rusting copper or brass wire. The lower end of the wire is attached to the wooden jaws of a clamp closed with a bolt and thumb nut to grip the iron pole beyond danger of slipping. This is the whole secret, except that this clamp must be loosened to let the doors close as soon as the martins have vacated in early August, thus shutting out all interlopers until April when the martins arrive from the south. When the house is of several stories and the entrances on several sides the doors may be operated together and the springs put on the topmost doors only.

Each room in the martin house should be about 7 x 6 x 6 inches, or 6 x 8 x 6, with the entrance holes 2½ inches.

# CREATURES OF OUR MOSSY POOLS

BY CATHARINE CURTIS



SUNNING THEMSELVES WHILE BEING PHOTOGRAPHED
Four home-grown spotted salamanders who had their origin in a strange jelly-like mass in the mossy pool

How well do we know this spot—this delightful little pool down in the woods hidden in the shadows of ferns and forget-me-nots with soft, green mosses clinging daintily to everything all about the edge. The floor of the pool is a collection of old leaves that have fallen there year after year, making a rich bed for cow lilies, arrowhead and other water plants. There are little bridges made by the roots of trees and old stumps. They are so thickly covered with delicate mosses that it looks like the work of fairies. Let us cross over, stepping from this soft mound to that firmer one. See what a handsome piece of work that moss-covered stump is, so delicate and fine we hesitate to step there with our big clumsy feet. This is a place made only for fairy folk.

Let's poke very carefully with a stick among those leaves there in the water. What a lot of that green scum there is! Scientists call the long, green, matted threads confervae, and give the name algae to the moss-like variety seen clinging to everything. Both confervae and algae, when fresh, are a food for fish, pollywogs and other creatures of the water.

Look, what is that! It seems like a mass of white jelly. And there is another bunch, much larger and green like the confervae around it, which makes it harder to see — Nature's way of protecting her own. This piece has dark specks all through it. It must be a cluster of eggs laid by something. But what? We will have to take them home and wait until they hatch to find out. So carefully we put both egg clusters in our pail and after visiting some of our other favorite spots go home with our prize.

A LOT OF SALAMANDERS-TO-BE
Two large clusters of the eggs of the spotted salamander in their protective jelly-like nest

Filling a dish with water, we put in these two masses of jelly, then place it outdoors on the porch in a shady place where there is good fresh air. Every day we can see a change. The specks grow larger and the masses of jelly increase in size. Inclosing each speck is a bubble, darker green than the rest of the mass. As days go by the specks in the bubbles change their round shape and grow longer. Now they have a head and tail and begin to wiggle. They look like tiny fish. By the middle of May these creatures have all wiggled their way out of their balloon-like chambers into the big, wide world. The creatures of our mossy pool are born! All this takes about one month.

Now we must feed our babies. What do they eat? Like young fish they eat lots of things in the water that we don't know of and can't even see because they are so small. So we visit the pool again and take home a pail of this water to put them in. In a still pool is the natural food of tiny living things which do not have a chance to breed in running water.

The babies grow longer and longer until finally two front legs appear, then two hind legs. Have you guessed what they are? "Pollywogs," did I hear some one say? No, because they do not lose their tails and they seem to be covered with little yellow spots. Do you give up? Well, our crea-

tures are spotted salamanders—a wide-ranging species.

They may be raised in confinement by following the instructions for raising young goldfish. During the aquatic stage they are constant feeders and it is not easy to supply them with the proper food. Also, like fish, they need plenty of water space for they grow very rapidly.

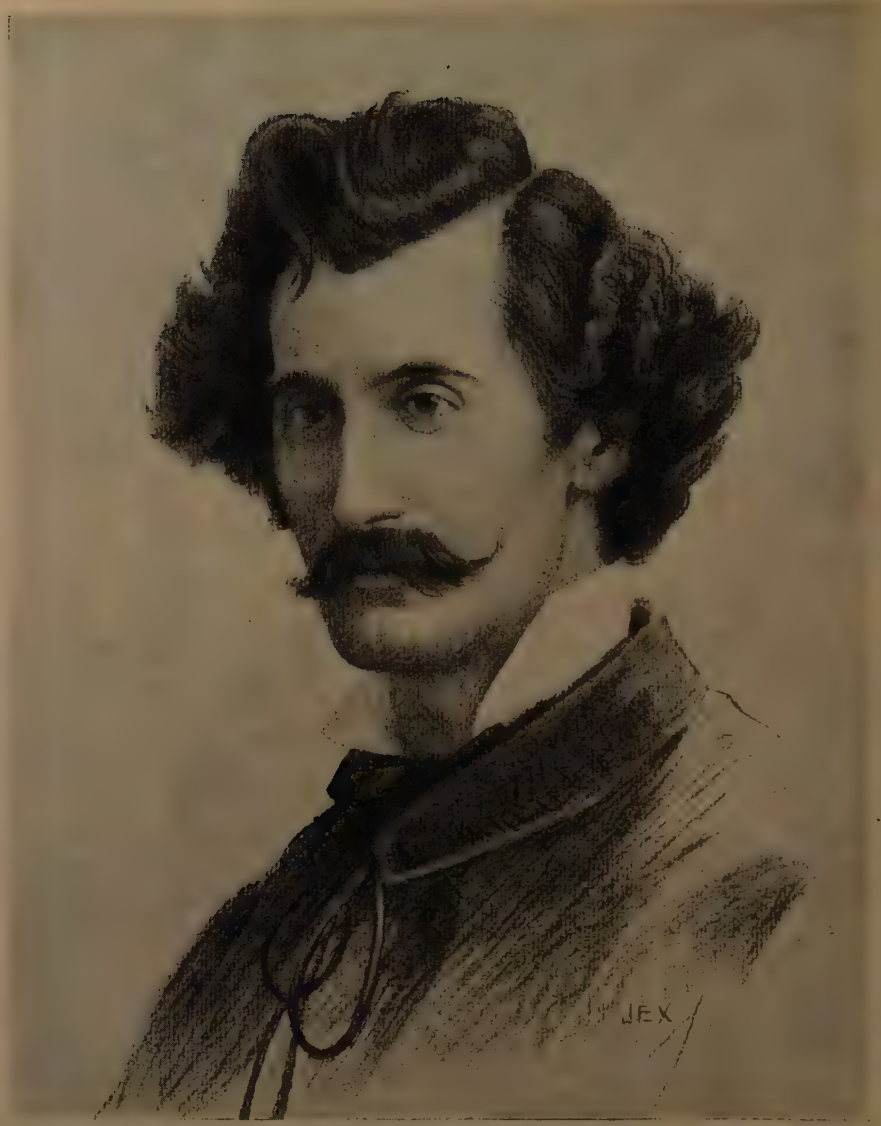
By the middle of August they will have lost their gills, their yellow spots appear and they are ready to come out on land to eat live insects. Their gills are antler-shaped, feathery-like projections at each side of the head. They live in the water only during the first few months of their lives. After this they will drown if forced to stay submerged in water. In two years they will be six inches long and old enough to lay eggs themselves for which purpose they return to shallow water for a short time in the spring like the toad. At other times they are secretive.

Salamanders are interesting to put in one's terrarium and have been known to live as long as nineteen years. Pieces of earthworms, slugs and other live insects make a suitable diet for them when in captivity. I let mine shift for themselves in my out-door pool until the change came and they were ready to come out on land. Then I raised them entirely on earthworms, holding the pieces before them between scissor points. They will starve to death in three or four days without food. One feeding a day, or in winter every other day, will do them. Occasionally they make a little squeak or chirping noise something like a cricket, at least I don't know how else to describe it. They are nocturnal and during the day hide under stones and dead wood.

"BECAUSE A DEER HUNTER FAILED TO LOOK FOR ANTLERS"—This is the title which Ben East, out-door editor of the "Grand Rapids Press," gave to this picture, and under this title it was reprinted widely in the newspapers. We reprint it here because it tells a vivid story of a tragedy of the wild; a tragedy wrought at the hands of a thoughtless hunter who illegally killed the doe and wounded the fawn, leaving it to a death by starvation beside its lifeless mother. The picture was taken by Walter Hastings, staff photographer of the Michigan Conservation Department. Mr. Hastings was engaged in filming a game law enforcement picture when this tragic incident was discovered and recorded. Although wounded and starving, the fawn recovered when fed and is now regaining its health at the Ogemaw State Game Refuge

# RILEY: WHO BLAZED TRAILS IN THE INSECT WORLD

BY
DONALD C. PEATTIE



CHARLES VALENTINE RILEY

ANY individual seen wandering wood or field and chasing bugs with a net is likely to be set down as crazy by his non-professional associates, and especially by strangers. If this is true today it was more nearly true sixty years ago when any form of science was regarded as an eccentric sort of hobby. Many people laughed at Benjamin Franklin for playing with lightning on a brass key on a kite string. "What is the use of it?" somebody asked the ingenious Philadelphian. "Of what use is a baby when it is first born?" retorted Benjamin. Now we realize too that even "bug-hunting" may be useful—not the mere collecting of insects, but the study of them. The conquest of malaria, yellow-fever, typhus-fever and many other diseases is dependent on the science of entomology.

The first and in many ways the foremost of the economic entomologists of America was Charles Valentine Riley, born on September 18, 1843, in Chelsea, London. As a boy he wandered the banks of the Thames in the country, and perhaps it was there he met and was deeply influenced by W. C. Hewitson, a great specialist on the butterflies. Certainly from boyhood Riley had a passion for the study of insects and loved to draw them. In school in the gray old seaport of Dieppe, France, and later at Bonn, in Germany, young Riley won prizes for his superb insect pictures. Of course there are many ways of painting or drawing insects, and a lover of bright colors might sketch them to eternity without getting anything more out of it than a little enjoyment. Riley had that rare and happy combination of real artistic skill and acute scientific observation and accuracy. Those are gifts given to few men at the same time. Even Audubon the bird painter was not always accurate, while Wilson's drawings of American birds are correct but not beautiful.

At the age of seventeen when Riley, poor but undaunted, came to America he was, then, already an accomplished entomologist for his years, and during his young manhood on an Illinois farm near Chicago he never neglected his opportunities to study the great insect world. Anyone who has walked across a bit of Illinois prairie and has seen the myriads of insects whirl up from before his feet knows that the prairies are not dull to the entomologist, any more than to the botanist, however monotonous as scenery. Illinois was still "young" country before the Civil War, and the sweep and freshness and spirit of the old Middle West entered Riley's nature and never deserted him.

Toward the close of the Civil War Riley entered the 134th Illinois Regiment as a private, but, as Abraham Lincoln said of his own fighting experience in the war

with Black Hawk, most of his fighting was fighting mosquitoes. Mosquitoes, however, are interesting to entomologists, and wherever Riley went, whatever he did, he always improved his time by study. Before long he was the entomological editor of the *Prairie Farmer,* in those days the greatest journalistic power and help among western farmers. Here he became the friend of the brilliant philosophical entomologist, B. D. Walsh of Chicago.

By 1868 Riley had become the state entomologist of Missouri, and while the title does not sound very lofty, and might have proved empty if worn by another man, it gave Riley a chance to prove once more a fact shown in the lives of many great scientists. This is the fact that one need not travel to strange places or have stirring adventures to make great discoveries. The life around your back door holds enough of mystery to occupy any scientist perpetually. And Riley's observations on the life histories and strange habits of the insect fauna of Missouri are of more importance to science, to humanity at large, than all the collections of rare or pretty Amazonian butterflies.

These great series of observations were published in nine volumes of reports from the state entomologist, and between the sober bindings of those volumes are contained discoveries that have stirred other scientists all over the world. "There is a vast number of facts and generalizations of value to me," wrote Darwin, "and I am struck with admiration at your power of observation."

It was Riley who suggested to the French that in order to replace the ruined grape vines of France, which had been destroyed by the Phylloxera pest, hardy American vines, inured to the attacks of Phylloxera, should be introduced. For this Riley received the cross of the *Légion d'Honneur.* Again, when a terrible plague of Rocky Mountain locusts swept down on the prairie states in the years 1873-7, it was Riley who worked out their life histories and the course of their strange and dreaded migrations. In recognition at last of the importance of systematic study of insects, Congress created an Entomological Commission, with Riley at the head. Later this merged into the Bureau of Entomology of the Department of Agriculture, one of the most useful wings of our government, indispensable to the farmer and to the public health.

No one who has not come up against it can imagine the struggles which science has to put up in order to survive when dependent on Congress. There are years in which wise legislators grant to the scientific services of the various departments enough money and support to carry on work; there are other times when a short-sighted policy has driven fine scientists out of the service because of red tape and lack of money. Once Riley was forced to resign his post, but he resumed it when urged by a repentant government. Throughout his long tenure of office he had to struggle to keep from the toils of red tape.

On one occasion an Australian insect that did great damage to California had to be combated, and Riley asked Congress for money to send men to Australia to study it and bring back the enemies that preyed on it to help keep it down in America. Congress, however, would not hear of spending a single American dollar outside America. Finally Riley persuaded an American consul just about to leave for his post in Australia to take two entomologists disguised as consular attachés, and in this way got around the blindness of Congress. The results were successful and the enemies of the harmful insect, when sent back, put the pest under control. Had Riley not practised this deception we would have lost millions of dollars due to the ravages of the introduced pest.

So through the many storms of a long service in the government Riley held his bureau together, and if he did not, in his reticent and sometimes even severe manners, always win friends at first, he won them in the end. Since his death his sterling worth as a scientist, and the great benefit of his work to the daily life of every American, has become increasingly apparent.

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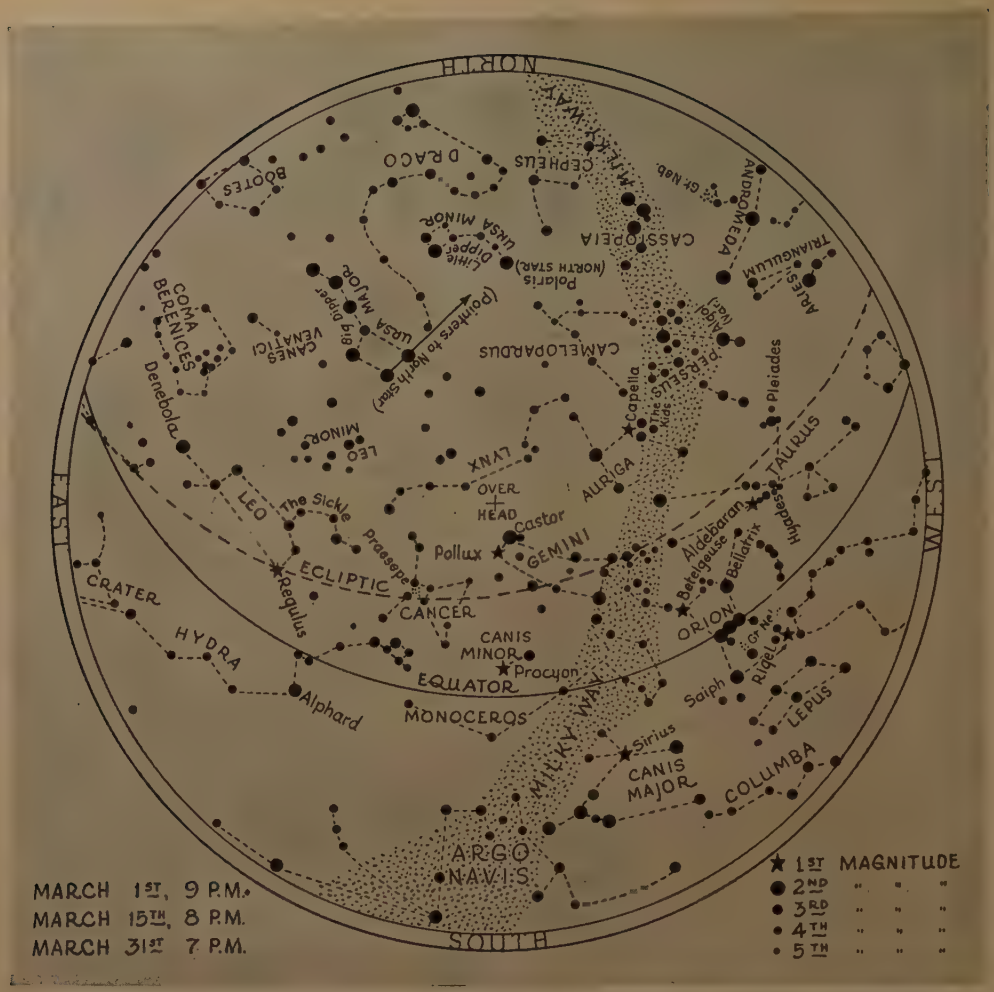
# A DOUBLE NASTURTIUM

BY CHARLES WILSON

ONE of the most fascinating things about flowers lies in the development of new kinds. Many startling results of breeding and hybridizing have come from the gardens of the professional horticulturists in recent years. One of the most interesting and most recent to make a sensation in the flower world is the double hybrid nasturtium evolved at the California farms of W. Atlee Burpee Company. An idea of what it takes to accomplish these floral feats may be gathered from the fact that some forty thousand crosses were made between Golden Gleam double nasturtiums and dwarf single nasturtiums to bring forth these new flowers. Through this process, all of which was by hand pollination, a color range from pearly lemon to brilliant scarlet was attained. And through all this the growers have been able not only to retain but to enhance an outstanding sweet scent. Such developments make one wonder whether there are any limits to what flower creators can do.




To use this map hold it before you in a vertical position and turn it until the direction of the compass that you wish to face is at the bottom. Then below the center of the map, which is the point overhead, will be seen the constellations visible in that part of the heavens. It will not be necessary to turn the map if the direction faced is south

# WHAT WE KNOW ABOUT COMETS

BY ISABEL M. LEWIS

THE ADVENT of a truly great comet is a rare event. Unexpected and unheralded; bizarre in appearance; with a star-like nucleus in a coma, or head, tens of thousands of miles across; with a tail millions of miles long; visible in some instances close to the sun in daylight, one may well imagine the abject fear that such an apparition once inspired in the great masses of people of all ages and nations. In the last century there were six or seven comets deserving the title of "great" comets. Notable among these were Donati's famous comet of 1858 and the great comets of 1861, 1881, 1882 and 1887. The last three were remarkable also for the fact that they passed so close to the sun that they were involved in its outer gaseous envelope and were all members of the same comet group moving in practically the same orbit.

In the present century, so far, with the exception of the expected return of Halley's periodic comet in 1910, no comet which might be called great has made its appearance. Not a single year passes by, however, without the appearance of a number of telescopic comets; some expected returns of periodic cometary visitors, others new objects. Some of these have even become visible to the naked eye, but the truly great comet of the Twentieth Century has not yet appeared, and if the record of the last century is to be matched it is long overdue. Unless it catches the astronomers napping it will be first picked up telescopically as a small, faintly luminous, fuzzy object. It may be doubtful at first whether it is a small nebula, an asteroid, or a comet. If motion is detected the first possibility is immediately ruled out, and after three observations have been obtained and an orbit computed its true nature will be ascertained.

It is now quite certain that a comet is not self-luminous but owes its brightness either directly or indirectly to the sun and the effect of its radiations upon the matter of which comets are composed. There is good reason to believe that the nucleus of a comet consists of a group or swarm of particles of various sizes. They may be mere

grains of dust or small stones, or rocks weighing hundreds of pounds or tons, and they are held together by their mutual gravitational attraction. The comet is usually discovered at a distance of two or three astronomical units from the sun, the astronomical unit being the distance of the earth from the sun. It is then extremely inactive, shining chiefly by reflected sunlight, though gases are being slowly expelled from the meteoric masses or particles in the nucleus so that the head of the comet begins to expand. As the distance from the sun decreases the effect of the sun's radiation becomes more pronounced. The head expands rapidly in size, and a tail has formed, directed away from the sun since it is composed of particles driven off from the head of the comet by the sun's radiation pressure. Now, paradoxically, as the comet draws closer to the sun the head begins to *decrease* in size, although more gases are being evolved and the tail is increasing rapidly in length. The decrease in size of the head is due to the fact that radiation pressure is now becoming so great that the gases evolved from the nucleus are being driven back more rapidly from the head into the tail, which is at its best at or near perihelion. As it recedes from the sun the comet carries its tail before it, opposite to the direction of the sun.

The tails of comets are composed chiefly of hydrogen, hydrocarbons, or carbon and nitrogen compounds. Cyanogen was conspicuously present in Halley's Comet. Iron lines also appear in spectra of many comets, and free nitrogen and sodium when the comet is near the sun. The appearance of the tail, its extent and curvature, depends upon the nature of the gaseous compounds of which it is composed, which, in turn, depend upon the composition of the nucleus of the comet.

When a comet is in the outer regions of the solar system it moves at a slow and leisurely rate of two or three miles a second, but as it draws in toward perihelion its speed increases tremendously. The Great Comet of 1843, which was first seen in broad daylight on February 28, 1843, close to the sun, had a velocity at perihelion of 342 miles per second. It was then only 78,000 miles from the surface of the sun and it took only about two hours to swing around the sun through 180 degrees in its orbit. The temperature of the region through which it was passing in the solar atmosphere was about 3000 degrees, and the tremendous activity taking place in the nucleus and coma produced a tail 180 million miles long.

Comets that approach so close to the sun have been seen to break up into several parts. The Great Comet of 1882, which was first seen as a naked eye object in New Zealand, was visible in broad daylight. It transited the sun and passed through the solar corona. Shortly afterwards the nucleus was observed to contain a number of star-like knots. The comet was disintegrating and four distinct nuclei were formed which at later returns would be separate comets. After a comet has returned many times to perihelion its nucleus has become so broken up and dissipated by the action of the sun's radiation upon the masses of which it is composed that it loses all of its former splendor and becomes only a faint telescopic object. Frequently swarms of meteors or meteoric dust follow in its path, once undoubtedly a part of the comet but driven off from the nucleus by radiation pressure. Fragments of the disrupted nucleus also follow the comet in its orbit.

Practically all of the periodic comets which return to perihelion at intervals of a few years are telescopic objects only. Some of them, whose orbits cross that of the earth, are followed by more or less dense condensations of meteoric particles which at the points where the earth's orbit intersects that of the comet may be swept up by the earth's atmosphere. On October 9, 1933, a great meteoric shower was visible in Europe, the count of individual meteors running as high as 100 a minute at maximum. The greatest display occurred about eight P. M. in Greenwich Time, and nothing was seen of the shower in this country, which was in daylight at the time of the display in Europe. This shower came from the direction of the constellation of Draco and it was found that its radiant was close to that given by the elements of the orbit of a comet of six-and-one-half-year period discovered by Giacobini in 1900 which had made a very close approach to the earth in September of last year, and which then showed traces of a tail, although a very faint object telescopically. Observations were made of this same shower in the years 1841, 1900, 1926. Such displays can, of course, only occur when the earth and the swarm arrive at the point of intersection of their orbits at the same time. Displays can occur every year only when the cometary matter has become so thoroughly disintegrated that it is distributed all along the orbit. Such is the case with the Perseids which follow Tuttle's Comet.

It is probable that comets are fragments of the original substance from which the solar system evolved and were ejected from the sun itself in the far distant past. If so they have been gradually disintegrated and swept up by the larger members of the system until little is left of the splendor of the truly great comets of the heavens of many ages ago.

The planet Jupiter is now a fine object in the evening sky in Virgo, close to the first magnitude star Spica. By the end of the month it will be visible nearly all night. Mars is still in the evening sky in Pisces but is too close to the sun to be seen. Mercury may be seen near the end of March in the morning twilight in the southeast close to the horizon. The time is not favorable for observation.

Venus attains its greatest brilliancy in the morning sky on March 11, and may be seen in the southeast before sunrise. Its distance from the sun continues to increase during the month. Saturn is now a morning star, also, but too near the sun to be seen to advantage. It is in the constellation of Aquarius. The sun will cross the equator coming north on March 21 at 2:28 A. M., Eastern Time, and spring will then begin.

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# THE WIND CHILD'S STORY

BY MARY M. CUTTER

MY FATHER is a big, strong, blustery North Wind,
And his name is Old Boreas.
He has the grandest time of any wind that blows.
When he starts a-blowing
All the loose boards
And signs
And shutters
Begin to flap and bang,
And the trees bend 'way over to get away from him,
And the waves of the ocean roll and roll
And beat upon the beach,
And the big ships are tossed about on the giant waves,
And all the people are frightened and sick
And my Father just roars and whistles,
Which of course is his way of laughing.

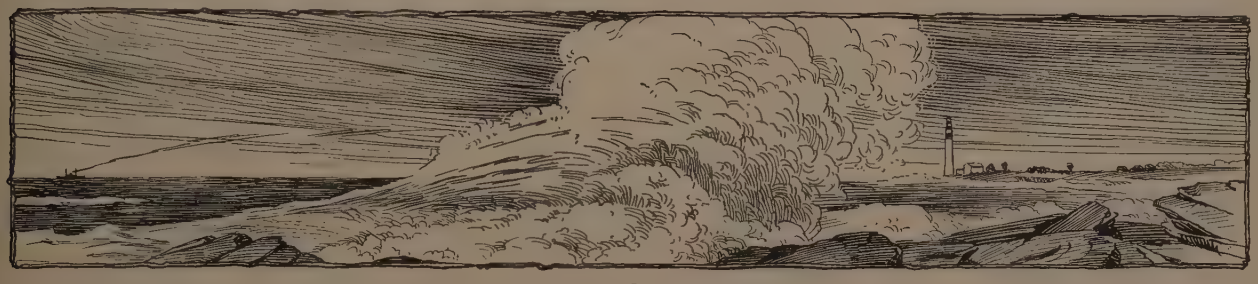
But my Mother is a soft gentle Wind
And her name is Zephyr.
When she starts a-blowing
The trees sway easily back and forth
And the baby birds in their nests are rocked
To and fro,
To and fro,
And the curtains at the window where a little sick child lies
Are stirred ever so gently,
And her cooling breath fans the little hot forehead
And brings comfort.
And loose leaves fall softly to earth

And roll across the grassy lawn
Till they pile up at the feet of the rose bushes,
And there they cuddle down
And form a soft blanket to keep the roots of the roses warm.
And when my Mother blows
All the people speak of the lovely breeze
And no one is sorry to have her come.
And she never roars or whistles
But softly she sighs
And softly she touches all things.

And all of us little Wind Children, oft called Breezes,
Go running along behind our Father and Mother.
Always chasing one another;
Sometimes roughly;
Sometimes gently.
And sometimes we get lost in a chimney,
Or hall,
And you can hear us—if you listen—
Sobbing and sobbing
There alone.
Sometimes we have such fun
When we are able to carry off a man's hat
And every one rushes madly after it,

And we wait till they almost catch up
And then give another puff
And send it a-flying.
And sometimes we blow out a fire,
Or a match,
Just as someone is ready to light their campfire.
And sometimes we are naughty
And blow dust in people's eyes,
Or papers off their desks,
And you can hear us—if you listen—
Laughing and laughing
As we pass by.

Once we were working in the woods
Carrying in our arms the little seeds
From all the flowers
And trees
And grasses
And dropping them here and there
Where they slowly settle down
And go to sleep in the soft warm earth
And never waken till Springtime,
When they begin to grow.
And we came upon a picnic.
Oh we were so happy!
And we blew the little girls' dresses
And rattled dry leaves down on their supper table,
And were having the best kind of a time,
But the children were so impatient
And scolded us so much
That our Father got awful cross
And he blew and blew
And blew the rainclouds right down on their heads
And they all got soaking wet.
Then my Mother hustled him back home
So he could not blow his cold breath upon them,
And she blew softly and warmly upon them,
And all of us little Wind Children scampered home
For we were afraid.



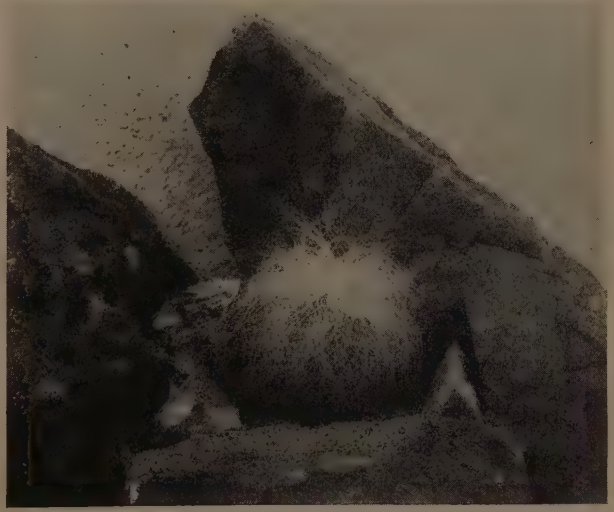
# THE OLD MAN OF THE DESERT

BY WRIGHT R. RUNDELL

STRANGE things may always be found on the desert. One of the strangest is a "white-haired" cactus. It is called the Old Man of the Desert.

Like all cactuses, it lives in sandy, dry soil, and must have a good deal of sunshine. It does not have leaves but many tough, hair-like, silvery threads which branch in all directions from a central stem. It looks like a head of white hair. Because it looks so delicate, this cactus is much admired by those who know desert plants.

The Old Man of the Desert should be welcome in any cactus garden. But, with all its beauty, it has beneath those silken hairs, hidden in Nature's ambush, many needle-like thorns. Old Man of the Desert is to be seen and grown—but not handled!



THE OLD MAN OF THE DESERT, A STRANGE CACTUS LIKE A HEAD OF WHITE HAIR

# A GARTER SNAKE FAMILY

BY GARRETT T. GREER

THE photograph gives one a pretty fair idea of the food problem of a mother garter snake, if her young were not able to take care of themselves. However, they can quickly find their own food.

This mother common garter snake was so large when I found her that I placed her in a cage for study. Next morning instead of one snake, there were twenty-eight in the cage. During the night the mother snake had given me twenty-seven young ones, each about seven and one-half inches long. I had a total of seventeen feet of snakes!

Each one was about the thickness of a lead pencil, and the color pattern was quite different from that of the mother. Common garter snakes are usually much more abundant than are other snakes and the picture shows the reason in a truly numerous way.

MOTHER GARTER SNAKE—FRIEND OF THE GARDENER—AND HER FAMILY OF TWENTY-SEVEN. DO NOT KILL THESE LITTLE SNAKES. THEY DO A LOT OF GOOD EATING INSECTS THAT INJURE THE GARDEN

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TINY PUFFBALLS, THE EARTH STARS, ARE FOR THOSE WITH BRIGHT EYES TO FIND

# EARTH STARS

BY DAVID HOWARD HARRINGTON

GRUBBING gently among the fairy ring tribes, we were searching for a young puff or any tender foldings of a baby earth star. What a surprise when we spied the tiny plant. Not youthful did it look, except for its delicate doeskin jacket. There it crouched under crumpled dust of broken badger-brush stems and decayed leaves.

This little puffball keeps growing in its dark, rooty, underground home. Only when fully grown does it poke its pointed peak through the crumbly cracks of earth like a Mongolian gnome shoving upward a cave door.

Sun, wind, rain; now a little dry, now a little moist; our little "geaster" often needs to cling closely with its skirts as the wind whistles around the north side of its few tufts of wiry grass and stunted badger bush. Such is the intensity of the prairie weather beating down upon him that the young star soon becomes old and dry. How easily it becomes light-headed. It tumbles, tired but careful to tilt the point of its tall hat just so as it topples over. Then one firm pinch of the Tibetan cap, and one last puff of dark seed-dust, and it settles into the bosom of the warm earth-bed.

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WHEN WINTER CAME, MR. L. R. FRENCH OF DES MOINES, IOWA, PUT THIS BLUEBIRD HOUSE ON A SHELF IN THE CELLAR. THEN CAME SPRING AND HE WENT DOWN TO GET IT. DURING THE WINTER A SPIDER HAD BEEN AT WORK AND HAD WOVEN A PERFECT FILMY WEB FROM CENTER POLE TO THE EDGES OF THE ROOF AND THEN DOWN THE SIDE WALLS ON ALL FOUR SIDES. THERE WAS NOT A FLAW IN THE WHOLE WEB

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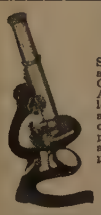

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## MORE LATIN NAMES

Again we present analyses of scientific names of two things described in this issue of Nature Magazine. The analyses are prepared by members of the Junior Science Club of the Latin Department of the Abraham Lincoln High School in Brooklyn, New York. The research was done by members of the Club as well as those whose names are signed to the analyses. This month the subjects are the Buffalo tree-hopper (Page 118) and the partridge or ruffed grouse (Page 130).

BUFFALO TREE-HOPPER—*Ceresa bubalis.* You may have seen a horse two feet long, but who ever heard of a buffalo less than three-eighths of an inch long? And have you ever seen one hopping in the trees? And do you know that he is pale green? You may be surprised, but this is all true of the Buffalo tree-hopper. And why is he called buffalo? Well, we would say it is because he reminds us so forcefully of our own bison, or buffalo, because of his humpbacked form. Few insects are honored with common names, but this has a good one.

Further, although the author did not tell us so, this little insect received his scientific specific name for the same reason. We find that he is called *Ceresa bubalis. Ceresa,* the genus, has several species besides the Buffalo tree-hopper and some of these are conspicuously horned.

*Ceresa* has reference to the horned appearance of these insects because the word is made from the Greek word for horn. In our own anatomy the *ceratina* (pronounced se-rat'-i-na) is the horn-layer of the skin, or the epidermis. In botany, *Cerastium* is a genus of plants with horn-shaped capsules; and *ceratodon* is an old name for the narwhal, given because of the horn-shaped tusk.

His specific name, *bubalis,* is Latin for wild ox, and the wild oxen (or wild cattle) are buffaloes. Undoubtedly the first describer of this remarkable insect gave it this name from the appearance that its enlarged pronotum gives it.

There are other creatures named because of some connection in appearance or habits with the buffalo. *Bubalornis* (from *ornis,* the Greek word for bird) is the Buffalo weaver-bird of Africa. These birds are named for their habit of following cattle in order to feed on the parasites that infest their hides. There is a Buffalo-fish, too, with a hump on its back, of the genus *Bubalichthys.*

HENRY HILSENROTH
BERNARD WAXMAN.

PARTRIDGE OR RUFFED GROUSE—*Bonasa umbellus.* Did you ever see a bison flying? No, we thought not. But if you visit the woods in the eastern United States you may because the partridge of the north (properly called the ruffed grouse) is named by the scientists *Bonasa,* from the wild ox or bison, with *umbellus,* which means the little shade or parasol. And you cannot find, for the moment, the relation of the bird to an ox.

The male grouse is famous for the drumming of his wings, described as "thump-thump-rup-rup-r-r-r," which is likened to the bellowing of a bull, but he is related to the bull only in the noise he makes. At first those who watched him thought the sound was vocal; later, since he often stood

(Continued on page 147)

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FOR this month the Travel Bureau of Nature Magazine offers its readers, literature and information on seasonal vacations, cruises, tours and trips.

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## THE SEA MAKES MEN GREAT

By Dr. Eugene Swan
of Pine Island Camp

Strong men have always been called by the sea and no country was ever great until it went to sea. Our own ships from New England, carrying our flag to the uttermost parts of the earth, brought recognition and respect to our infant republic. Though they represented an era in American life that is gone and will never return, there are still romance, adventure and achievement for those who sail the coasts of Maine.

The State of Maine has a coast so long that if it were straightened out in a direct line it would equal all the rest of the shore of the eastern seaboard; a coast with great indented bays twenty feet deep; with seals asleep on the rocks and porpoises splashing rainbow spray; with delightful ocean thoroughfares running out to islands where the fir and spruce troop down to the water's edge in a symmetrical formation which gives them the appearance of being carefully tended; with delightful seacoast towns which will live forever in the memory of any sailor who casts anchor there; with thousands of sea-gulls drifting shoreward at twilight, their delicate wingspread tinted with light, bringing a spark of color to the rooftops of ancient warehouses and rotting wharves.

Those who go to sea in magnificent ocean liners know nothing of the keen sense of satisfaction which comes with conning a yacht successfully. It is matching wits against the elements to bring a boat with one's own hands safely into port. Nothing else can give just that sense of unity with the sea and the heavens, or that feeling of physical, mental and spiritual rebirth. Men are highly susceptible to this experience and boys are doubly so. Many small children are excellent yachtsmen. They thrive in the sunlight and salt breeze and take on a delightful air of responsibility.

Through the memories of more than twenty summers of cruising the Maine coasts with parties of happy youngsters there are scores of incidents that stand out sharply because of that unmistakable something

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| | |
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| 2. France | 19. Mexico |
| 3. Italy | 20. South America |
| 4. Germany | 21. Bermuda |
| 5. Switzerland | 22. Hawaii |
| 6. Holland | 23. California |
| 7. Sweden | 24. New England |
| 8. Norway | 25. Maine |
| 9. Egypt | 26. Glacier Park |
| 10. Russia | 27. Yellowstone |
| 11. Spain | 28. Grand Canyon |
| 12. India | 29. Jasper Park |
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which conning a yacht—doing the thing himself—does to a boy.

There was John, a lad in early adolescence, with a small body, a fine forehead, and an aristocratic nose surmounted by big bone glasses. His school life was miserable because he was unable to enter into athletic competition with his mates. He had the wistful air of being all ready to go somewhere but unable to find the way to get started. When we embarked from Camden Harbor one summer's morning on a little schooner yacht, everything about the boat appealed to John's sense of fitness. He responded to its neatness, its order, its definite demand for the right action at the right time. The magic compass enshrouded in its shining brass binnacle spoke to him of the enchantment of the sea rovers which up to now had only seemed something between the two covers of a book. The finding of one's way on a chart, the art of navigation, the fact that through the dark, the surf and the fog the yacht came to an exact spot, to its own, waiting buoy, kindled something in the thwarted, furtive personality of this lonely lad. It gave him an outlet, a release. The fact that he could steer and trim a jib sheet as well as anyone gave a new set to his thin shoulders, a new tilt to his pointed chin.

At the end of two weeks, five pounds heavier, sun-burned, clear-eyed, he sauntered up the gangplank to the yacht club, a man among men, a living evidence of youth's response to the lure and the lore of the sea.

Yachting is safe along Maine's coast in clear weather to anyone who can read a chart and knows something about sailing. There are excellent places to purchase supplies and delightful harbors when one wishes to put in for a night. Camden, North Haven, Bucks Harbor, Sargentville, Blue Hill, Northeast Harbor, and Bar Harbor are all happy places for a yachtsman. To anchor in one of Maine's almost landlocked harbors where the spiked fir trees stand out against the sky, brings a sense of mighty independence, a complete severance from the world. To hang out one's riding light, then to watch the square of moonlight through the cabin hatchway move from starboard to port and back again as the boat swings in the tideway is something to cheer one in days that are joyless. Take one last look up the hatchway, watch the topmast nod slowly across the stars, and then lie down to rest with that wonderful sense of well being which we have when we "cast anchor in the harbor of a dream."

## Ptarmigan Steals Ride

To a little white ptarmigan, Engineer Richard Smith, who pilots a Canadian National train between Dauphin, Manitoba, and Hudson Bay Junction, Sask., is something of a Santa Claus. During a recent run of his train Engineer Smith saw the ptarmigan fly to the running board of the locomotive a short distance out of Seba. There it sat, oblivious to the bell and the whistle, for more than fifty miles when Smith, noticing it was beginning to suffer from the intense cold, lifted it into the cab. When the train reached Dauphin the bird made no effort to leave the cab and the engineer took it home with him where it is now living in contentment.

## "GRUNTS"

(Continued from page 114)

It was really pitiful! The same old problem of the mixed race: for mixtures of the spirit are as fatal as mixtures of the blood. No one could have known "Grunts" and not realized that he was a victim of artificiality. He had absorbed it himself through the channel of his great love, and he paid the price for it. But it is of more than sentimental interest that, in a few months, the instincts of ages could be reduced to but one impulse—that of burying things. There is no better comment on how civilization and personal affection unfitted "Grunts" for life than the fact that, in preparation for the oncoming winter, he cached, for safekeeping, a tube of glue and a red rubber eraser!

And where is "Grunts" now? If we only knew! One night he did not come home to dinner. That was his epitaph. Perhaps he had a fall that killed him; he was never very expert at climbing or at judging distance. Perhaps, trusting as he was, he did not fear the owls as he should have done; he who was so sophisticated in many ways could not, however, have been well versed in woodcraft. Perhaps—oh, there are so many perhapses concerning one small squirrel in such a big world! But wherever he is, or his little spirit is, for to have loved and roused love is a gift of spirit, he has left a real gap in the lives of his foster family. Having known "Grunts", one could never see a wild creature dart across his path that he did not feel richer for having had the opportunity of looking into the heart of this little gray squirrel and finding there both loyalty and love.

## A Novel Book

Here is something new in books. Its title is *The Animal Kingdom*, which is not startling because there have been many animal books. But there is a trick to this one. When you open it you find it full of pictures which look as though the printer had done a terrible job of color printing. Then you find in the inside cover a pocket containing a pair of spectacles, one eye of which is red cellophane and the other blue. This is called the Ortho-scope. Looking through these colored optics at the pictures, you find the same effect as with the old stereoscope and its double-barrelled pictures that used to adorn so many parlor tables. In this book pictures of the habitat groups at the Field Museum of Natural History have been used and each picture is accompanied by descriptive text, making the volume valuable informationally as well as novel in idea. This is the first of a group of similar volumes. It is published by the Orthovis Company, Chicago, Illinois, and sells for two dollars.

## Can Pigeons Read

A carrier pigeon arrived at the Los Priteos Camp of the Civilian Conservation Corps in the Santa Barbara National Forest in California in an exhausted condition. The band on the leg reads: "Aug. 31 C.C. 118" and the number of the camp is C.C.C. 118. Now the boys are wondering.

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## PHOTOGRAPHIC DEPARTMENT

(Continued from page 106)

natural size down to any desired smaller ratio, and they are also equipped with adapters which fit into the tube of any standard microscope, converting it into a highly efficient photomicrographic camera. Such a camera is shown in one of the accompanying illustrations.

The film used should be supersensitive panchromatic (available now for all types and sizes of amateur and professional cameras). This film avoids many of the disappointing results due to colors encountered in the specimen. Specimens covered with cover glasses are usually more satisfactory than others. The microscope can only focus on one plane at a time, so that the flattened, permanent preparation gives better results than will be obtained by fresh, uncovered preparations. Pond life, photographed alive, should be immersed in water, covered with a cover glass and a crystal of chloral hydrate placed at the edge of the cover glass to narcotize the specimens.

For uncovered, fresh specimens, low powers ranging from five to twenty diameters should be used. As subsequent enlargement gives an increase of from three to ten diameters, a ten diameter negative gives a print of from thirty to one hundred diameters.

This work is more interesting if you develop your own films as this frees you from the restraint of depending on the commercial finishers' standardized methods. By doing your own, developing tests immediately, experimenting with photographic filters to alter the appearance of the result and with various kinds of films, you will find in amateur photomicrography a branch of scientific relaxation which yields rewards not surpassed by any branch of amateur science.

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## MORE LATIN NAMES

(Continued from page 144)

on a log, they thought he beat his wings against the log or his own body; but he is beating only the air, and his wings move so rapidly that they seem blurred. Neltje Blanchan says the bird orchestra is the only one containing a drummer who doesn't use a drum.

The latter part of the name refers to the umbrella-like tufts of feathers on each side of the neck, for *umbra* in Latin means shade and *umbella* means sunshade. These tufts are easy to see, for they are dark and glossy, like velvet, and greenish or purplish black.

The jellyfish has an umbrella, for that is the name given to the bell-shaped disk that is used for swimming; and a colonial sea-animal, which radiates beautifully from a long slender base, is called *Umbellularia*. In botany an *umbel* is a spreading flower-cluster, like that of the wild carrot. In astronomy, the *umbra*, at the time of an eclipse, is that part of the shadow of the earth or moon from which light is entirely cut off, and the *penumbra* (almost a shadow) is the outer part which receives some light. So when you hear and see a ruffed grouse, look for the umbrellas on his neck and remember why his name is like the bull's.

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## Garden Flowers in Color

It is a matter of extreme difficulty to refrain from the use of a veritable thesaurus of superlatives in dealing with the new volume entitled *Garden Flowers in Color,* by G. A. Stevens, just issued by the Macmillan Company, for the reason that it is indeed a unique presentation. It is not mere publisher's "blurb" to state that never before has there been placed before the public at so modest a price ($3.75) anything like such an array of loveliness as this assemblage of illustrations in color of our common garden flowers. Each representation is unusually close in its resemblance to the actual blossoms from which made, and the extreme accuracy and high quality provide in compact form an important and dependable guide to the best garden adornments now in American use. Primarily a picture book, its 320 pages contain 382 drawings in full color of 847 varieties of plants, accompanied by textual matter which has been prepared with much fidelity to fact, and which tells many things needful to know about plant habits, use and cultivation. An endeavor has been made to include every important plant and shrub now grown in American gardens, under an alphabetical arrangement from Abelia to Zinnia. There has been no attempt to consider the rare or little known plants, but much care has been taken with cross-bred plants or hybrid varieties. Especial attention also has been given to inclusion of much miscellaneous information dealing with such themes as the growth of bulbous plants, effects of sun or shade, the character of the soil for different varieties, proper time of planting, and most artistic arrangement of flower beds. Particular directions are given for artificial preparation of acid soils for such plants as Rhododendrons and Azaleas. Scientific names are generally used since these best indicate natural relationships, are just as easy to pronounce and to remember, and in many cases are in every day use, as Petunia, Geranium and Phlox. Only common names which are universally accepted can be trusted, such as Pansies and Snap-dragons. All the garden plants are divided into three distinct classes, annuals, biennials and perennials. Some idea of the aesthetic richness of the volume may be gained merely by enumeration of some few of the many varieties treated and pictured therein: as, Aster 8 varieties, Azalea 17, Chrysanthemum 10, Clematis 4, Dahlia 7, Daisy 6, Dianthus 9, Honeysuckle 5, Iris 10, Lily 13, Magnolia 5, Narcissus 6, Peony 14, Phlox 6, Poppy 9, Rhododendron 4, Rose 26, Spiraea 7, Tulip 28, and Viburnum 13 varieties. The book is intended to be an actual primer or guide book for the beginner as well as a work of reference for the advanced gardener.


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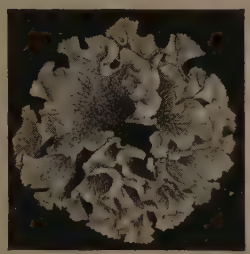

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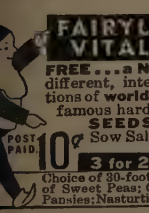

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## NEW PLANTS FROM OLD

(Continued from page 129)

the amateur who is starting plants in flats or pots rather than in specially-built solid benches such as the commercial grower has at his disposal.

The medium in which the cuttings are to be rooted may be placed in any convenient container. A depth of four or five inches will answer for most soft-wood or firm-wood cuttings. Whatever is used, good bottom drainage must be provided. A flower pot or a bulb-pan will be found convenient for small quantities. A small flower pot filled with peat-moss, which is kept saturated, placed inside of a larger pot or a bulb-pan in which the cuttings are inserted, is a good arrangement; or a bulb-pan may be set in a deep saucer and the moisture supplied by keeping water in this constantly.

Usually roots develop more quickly if a moderate degree of "bottom heat" can be supplied. That is, the soil should be kept from two to ten or fifteen degrees warmer than the atmosphere. This is most necessary for tender or warmth-loving plants such as coleus, heliotrope, salvia and the like.

An important point is to prevent the cuttings from wilting. Therefore it is of great advantage to keep the atmosphere about them close if it is possible to do so. If the pots or other containers in which the cuttings have been placed can be put in some enclosure with a glass covering, this is desirable, but sufficient ventilation should be supplied to prevent the foliage and the surface of the soil from remaining wet.

Firm-wood cuttings and hard-wood cuttings can be placed in a frame out-of-doors, being kept covered with glass until rooting takes place. In hot weather of course they must be shaded. Newly-placed cuttings of any kind which show an inclination to wilt should be shaded with newspapers, and if necessary given an occasional light syringing to keep the tops "fresh."

Hard-wood cuttings made in the fall are often kept over the winter packed in slightly moist sand or peat-moss, and set out in the spring. If tied in bundles they are frequently placed in a frame or trench upside down and covered with three or four inches of soil to hasten the callusing of the lower ends before being set where they are to root. They are covered to about three-fourths their length.

For soft-wood cuttings, under favorable conditions, three or four weeks will often be sufficient to start new roots—for the cuttings to "strike" as the gardener terms it. There is no advantage in allowing the roots to grow long before potting the plants or transplanting them to rows. Remove them from the rooting medium when the new roots are from a quarter to a half inch long. Soft-wood cuttings are usually transferred to two- or two-and-one-half-inch pots, using finely-sifted soil with about a third of peat-moss and a small amount of bone flour added. The growth is often rapid


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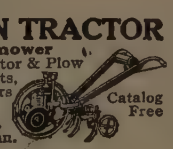

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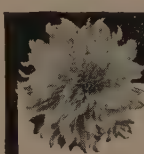

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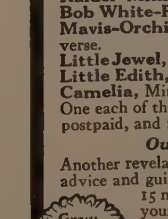

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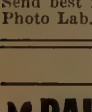

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and after a few weeks the roots should be examined to see when they will be ready for a shift. This will be indicated when the new roots begin to form a network around the inside of the pot. Both cuttings and young plants from seed, when first potted, should be shaded for several days from direct sunshine to prevent wilting, and watered only moderately until they have become established.

Root cuttings are not inserted endwise like the others but are usually placed horizontally and covered with a half-inch to an inch of the rooting medium. The methods of producing new plants by division and by the various methods of layering will be discussed in a future article.

### Rock Gardeners

Enthusiastic response to the announcement of plans for the organization of The American Rock Garden Society is reported by the committee engaged in the preliminary work. This support is coming both from professional and amateur planters of rock gardens all over the country. It is planned to organize on the basis of regional vice-presidents. The first formal organization meeting will be held at the Hotel Commodore in New York on March 21, 1934, at which time it is hoped to have Sir William Lawrence, president of the Alpine Garden Society of Great Britain, as the guest of honor. All interested in this new horticultural group may secure further details from Mrs. Dorothy Ebel Hansell, editor of *The Gardener's Chronicle of America*, 522 Fifth Avenue, New York City.

### Wild Life Committee

Announcement has been made by Secretary of Agriculture Wallace of the appointment of a committee of three to outline a course of action under a proposed plan for enlarging the areas on which migratory game birds and upland game birds can breed. Among other proposals the plan calls for the diversion of marginal farm lands for use in the production of this kind of game.

The appointments, which had the approval of President Roosevelt, are: Thomas H. Beck, Wilton, Conn., editorial director of Collier's, chairman; J. N. Darling, newspaper cartoonist, Des Moines, Iowa; Aldo Leopold, head of the department of wild life conservation, University of Wisconsin, Madison. Mr. Darling for some time has been a member of the Advisory Board, Migratory Bird Treaty Act.

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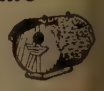

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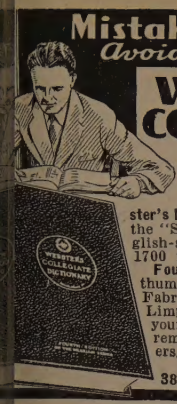

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A new book by Dr. Ditmars is always a real event. This time the thrill of scientific exploration will reach an even wider audience than did any of his previous books. His latest work, *The Forest of Adventure* (Macmillan, $2.50), tells the story of a cruise taken on an ideal yacht, remodeled into a floating scientific laboratory. During this cruise a group of specialists visit various areas in the West Indies and in South American jungles, and the volume is filled with their mishaps, adventures, discoveries, defeats and triumphs. There are discussions of such widely varying themes as ticks, red bugs, giant lizards, parrots, crocodiles, tree frogs, luminous beetles, hissing owls, tarantulas, sloths, giant forest frogs, fire ants, fruit opossums, vampire bats, red-eyed toads, silky-haired ant eaters, pumas, tapirs, anacondas, spider monkeys, marmosets, ocelots, weasels, toucans, iguanas, peccaries and others too numerous for specific enumeration. There are also information and highly practical discussions of such subjects as most useful portable equipment, use of short wave radio, possibilities of personal injury, blood tests for malaria, use of geographical and meteorological data, effects of quinine upon human organisms, and methods of capturing wild animals. Of course the outstanding event of the book is the details of the capture of the rare giant armadillo (illustrated by Artzybasheff on the dust jacket), though accounts are given of other collections of note, as instance the catching of a rare butterfly, or the successful bringing in of a big tree rat, a barking frog, and other like objects. The author assures us that every important incident of this story is based on actual fact and he has included a group of photographs taken during his own explorations dealing with subjects about which he has written. In the multiplicity of its various kinds of animals and plants and other natural history forms there is in this work something reminiscent of our boyhood favorite, Wyss's *Swiss Family Robinson,* and surely there could not be for it any higher praise.

---

## Forest of the Past

The latest in the excellent series of bulletins issued from time to time by the Field Museum of Natural History in Chicago is entitled *A Forest of the Coal Age.* The title is indicative of the fact that it deals with the lush forests of an ancient day, forests that lived and died and were buried to make our coal of today. It is the work of B. E. Dahlgren, acting curator of the Department of Botany. The bulletin is available for twenty-five cents from the Museum.


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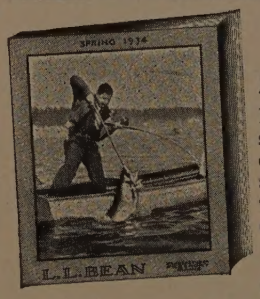


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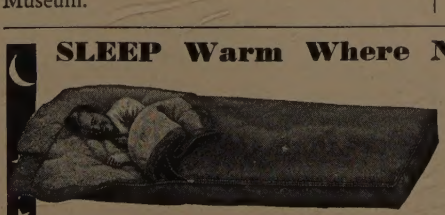

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## Spring Wild Flowers

Every enthusiast who attempts to make a wild flower collection this year will find helpful a little volume on *Spring Wild Flowers of the Open Field*, just issued as one of the Western Nature Study Series (Natural Science Department, San José, California State Teachers College, $2.50). While primarily intended for use in California, it contains answers to many of the queries that teachers, students, and others ask wherever wild flowers bloom on hills or meadows or lowlands. Consideration is given to such topics as position of wild flowers in the plant kingdom; on the art of understanding flowers; functions of a flower; keys to names of wild flowers; a 30-page tabulation of the spring wild flowers of the open fields; the care and record of specimens; lists of manuals and handbooks useful in studying West Coast flowers, and a glossary of the more commonly used botanical terms. Among those who have participated in assembling the work are Gayle Pickwill, Earl Count, Carl D. Duncan, Emily Smith, Barbara Norris, and Karl L. Hazeltine. The illustrations are numerous and well selected and will give much aid toward a fundamental knowledge of flower groups by those who cultivate "that intimacy with the changing face of the year's seasons which is in itself an adventure in contentment understood only by the initiate." A delightfully written little book on an interesting subject, it will have a wide appeal.

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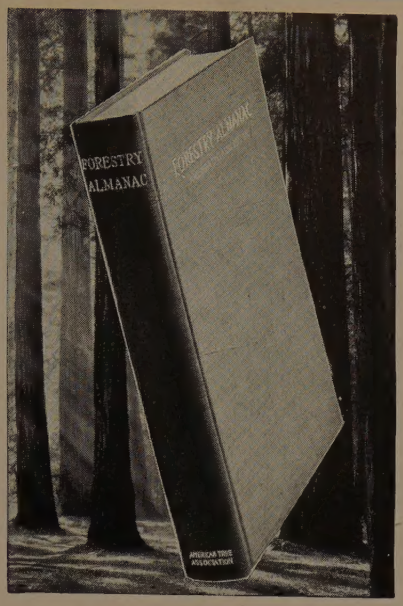


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